INTERFACE CONTROL DOCUMENT (ICD)

FOR THE

DATA COMMUNICATIONS INTERFACE (DCI)

AND FOR THE

TERMINAL PLAYER UNIT (TPU)

TO

DETECTION DEVICE (DD) INTERFACE DESIGN

FOR THE

JOINT MULTINATIONAL READINESS CENTER (JMRC)
INSTRUMENTATION SYSTEMS (IS)

RANGE DATA MEASUREMENT SUBSYSTEM (RDMS)

DOCUMENT CHANGE RECORD

PCR#	Date	Revision	Description of Change	Pages Affected
	8/21/91	A	Updates and corrections to interface documentation and responses to Government comments.	Complete Revision
	12/11/91	B	Updates and corrections to interface interface documentation agreed to by Cubic and Loral on 12/6/91.	Complete Revision
	12/18/91	C Ch1	Revision to applicable documents paragraph 2.2 and revision to item 5 of paragraph 3.9.2 Power on Sequence. These revisions denoted by double change Bars.	3,17
548	6/5/92	C	Updates, corrections and responses to Government comments. Removed all change Bars and converted to FrameMaker.	All
814	6/26/92	C Ch1	Updates, corrections and responses to Government comments.	B-3, B-15, B-25
C423	6/1/93	C Ch2	Clarifications and corrections resulting from Integration and test.	ii, A-2, A-11, A-26 A-28, B-17
1266	8/24/93	D	Updates and corrections to interface documentation directed by NTC SISGC and Loral 7/29/93.	All
	5/10/94	D Ch1	Updates and corrections to incorporate NTC, JRTC-IS and AGES II.	All
	4/5/95	D Ch2	Updates and corrections resulting from ICD validation and DCI/SMODIM Interface Definition.	All
	4/25/95	D Ch3	Revisions to SMODIM Unique Messages	C-10, C-15, C-30, C-33, D-2, D-20
	6/5/95	D Ch4	Updates and corrections resulting from ICD validation.	iii, 37, 43, 45, 47-53, A-11 - A-15, A-17, A-18, A-26, A-27, A-37, C-13, C-14, C-24, C-28, C-32
	11/15/02	F	Updates and corrections resulting from ICD Validation	All
	12/15/12	G	Updates and to conform to the JMRC Precision Real Time Location Tracking System (PRTLS), and JMRC IFC Lifecycle Replacement Project and delete JRTC and NTC from the ICD	All

CHANGES FOR JUNE 2002

DATE	Description of Change	Pages Affected
06/02	SPECIFICIATIONS – Corrections and updates to Gov and Non-Gov Documents	Page 1, 2
06/02	JMRC-IS Player Unit Interface Block Diagram Update	Page 4
06/02	Figure 4.1-1 NTC-IS Player Unit Interface Block Diagram – deleted SAWE Master Control Station and GPS Reference Receiver	Page 28
06/02	Section 4.8.3.1 – Deleted	Page 51
06/02	NTC-IS Event Report Message Format (continued)	Page 54
06/02	Format/Editorial Change	Page 57
06/02	Reference to Section 3 in Section 5 does not apply	Page 59
06/02	MIL-STD-348 updated to reflect Rev. !	Page 60
06/02	Spelled out Voltage Standing Wave Radio	Page 68
06/02	Deleted last sentence in Para. 5.5 – it is an NTC description and does not apply	Page 71
06/02	Paragraph 5.6, deleted sentence referring to Section 4.3.1	Page 71
06/02	Correction to JRTC Basic Message Format	Page 73
06/02	Update to Section 5.8 – JRTC-IS Power On	Page 78
06/02	Reference to Section 3.9.4 deleted – it does not apply	Page 79
06/02	Section 5.8.3.1 and 5.8.3.2 – Deleted last 2 steps on sequence – they are not programmed as part of the initialization routine	Page 80

CHANGES FOR AUGUST 2002

DATE	Description of Change	Pages Affected
8/02	Corrected name of Reference Document PMT 90-S002 Rev F	Page 2
8/02	4.1-1 Player Unit Interface Block Diagram updated	Page 28
8/02	Paragraph 4.7.1 – added LBA event and missed SMODIM events under DD to DCI and added remote designation under DCI to DD section	Page 44
8/02	Paragraph 4.8.2.1, the message sequence, items 3, 4, and 5 and end note deleted.	Page 50
8/02	Paragraph 4.8.3.1, revised message	Page 51
8/02	Paragraph 4.8.3.1.1, revised sequence	Page 51
8/02	Paragraph 4.8.4, revised	Page 52

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1. SCOPE

1.1 Identification.

The Interface Control Document (ICD), 706014, applies to the Data Communications Interface (DCI) and Terminal Player Unit (TPU) to Detection Device (DD) interface design for the Joint Multinational Readiness Center Instrumentation System (JMRC-IS).

There are four types of Detection Devices currently in use at the JMRC:

A. SAWE/SAWE/MILES II Vehicle Detection Device (VDD)
B. Individual Weapon System (IWS)
C. Wireless Independent Target System (WITS)
D. Air-to-Ground Engagement System (AGES) II/Small On-Board Data Interface Module (SMODIM) equipment.

The JMRC-IS has two types of communications interfaces for interfacing to the Detection Devices:

A. Data Communications Interface (DCI). The DCI is an embedded computer system combined with a Commercial Off- the-Shelf (COTS) Terrestrial Trunked Radio ((TETRA) an ETSI standard Professional Mobile Radio (PMR) reference http://www.etsi.org/website/technologies/tetra.aspx) system containing a GPS. JMRC-IS DCI systems were fielded as lifecycle replacements for the aging TPU systems starting in 2009. The software contained in the DCI systems is Government owned. The DCI based system relies on the COTS TETRA radio to produce position messages according to the TETRA standard and does not utilize the GPS functions of the detection device (if present).
B. Terminal Player Unit (TPU). The TPU is an embedded computer system with an internal TETRA radio module which was fielded in 2003. The software contained in the TPU's systems is proprietary to Rheinmetall Defence AG. The TPU based system does not contain a GPS and therefore can only work with Detection Devices which are GPS equipped and comply with this ICD to send GPS time, position and velocity messages.

For the purposes of this interface control document, the term Player Unit (PU) should be interpreted to mean an integrated equipment suite consisting of Data Communications Interface or Terminal Player Unit and a Detection Device.

1.2 Document Overview.

This document provides the interface design for the external interface of the DCI and TPU to the SAWE/SAWE/MILES II Detection Device, Individual Weapon System (IWS) and Wireless Independent Target System (WITS). Additionally, it defines the electrical, mechanical, and functional interfaces. A detailed description of the individual messages that cross the interface between the DCI and TPU and the Detection Device are in Appendix A and Appendix B.

This document also provides the interface design for the external interface of the TPU to the SMODIM Detection Device. The electrical and mechanical interfaces between the TPU and SMODIM are identical to that between the TPU and SAWE/SAWE/MILES IIVDD. For TPUs that interface to SMODIM equipment, detailed descriptions of the individual messages that cross the interface are in Appendix C and Appendix D.

2. Applicable Documents

2.1 Government Documents.

The following documents, of the exact issue shown, form a part of this specification, to the extent specified herein.

SPECIFICATION:

JMRC-A-001/Rev B	System Specification for the Integrated Combat Maneuver Training Center Instrumentation System (JMRC-IS)/Simulated Area Weapons - Radio Frequency

(SAWE-RF), 9 April 1993

STANDARDS:

MIL-STD-348A Notice 4, 16 July 1999	Radio Frequency Connector Interfaces for MIL-C-3643, MIL-C-3650, MIL-C-3655, MIL-C-25516, MIL-C-26637, MIL-C-39012, MIL-C-49142, MIL-A-55339, and MIL-C-83517
MIL-STD-461D	Requirements for the Control of Electromagnetic Interference Emissions and Susceptibility, 19 June 1997
PMT 90-S002 Rev. M	Live Tactical Engagement Simulation Systems Interface Control Document (LTESS_ICD)

Copies of specifications, standards, drawings, and publications required by suppliers in connection with specified procurement functions, should be obtained from the contracting agency, or as directed by the contracting officer.

2.2 Non-Government Documents.

The following documents of the exact issue shown form a part of this design to the extent specified herein. In the event of a conflict between the documents referenced herein and the contents of this specification the contents of the specification shall be considered a superseding requirement.

SPECIFICATIONS:

IRS706011	Interface Requirement Specification for the Integrated JMRC-IS/SAWE-RF Special Task; Cubic Defense Systems

OTHER PUBLICATIONS:

TIA-232F	Interface Between Data Terminal Equipment and Data Circuit Terminating Equipment Employing Serial Binary Data Interchange, 1 October 1997
IS-GPS-200, Rev.F IRN 001	NAVSTAR GPS Space Segment/Navigation User Interfaces
RTCM 134-89/SC 104, 68, Version 2.0	RTCM Recommended Standards for Differential NAVSTAR GPS Service, January 1, 1990; Radio Technical Commission for Maritime Commission

3. JMRC-IS

3.1 JMRC-IS System Overview.

The Integrated JMRC-IS system supports the realistic, stressed, close combat heavy (CCH), battalion task force training of the Joint Multinational Readiness Center Instrumentation System (JMRC-IS).

The Integrated JMRC-IS system, in accordance with specification JMRC-A-001/Rev B, provides the capability to support U.S. Army field training exercises from platoon level to brigade level. The system has been designed to simulate indirect fire for field artillery, mortars, chemical and nuclear munitions, and mines, as well as direct fire utilizing Multiple Integrated Laser Engagement System II (MILES II). It is intended to support training of the following:

A. Reaction to indirect fire.
B. Employment of supporting fires.
C. Operation in a contaminated environment, and
D. Conduct of mine/counter mine operations.

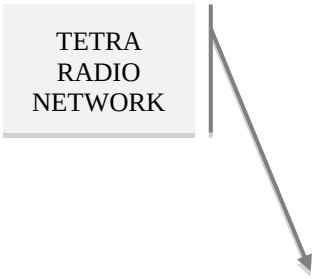
Figure 3.1-1 shows the DCI and TPU to DD interface within the Integrated JMRC-IS.

The Integrated JMRC-IS system accommodates one method of Area Weapon Effects (AWE) Casualty Determination, Centralized. In the Centralized Method, AWE Casualty Determination is accomplished by the Core Instrumentation Subsystem (CIS) and resultant Kills are reported to the affected integrated players by Kill Event Commands sent to them via the Range Data Measurement Subsystem (RDMS) DIS Central Node. Direct fire events are recorded by the Detection Device and reported to the CIS via the DCI or TPU and DIS Central Node. The DCI/TPU to Detection Device interface provides the DCI/TPU with SAWE/SAWE/MILES II Event Data.

Due to the lack of an internal GPS in the TPU, the Detection Device interface provides the TPU with GPS Time, Position and Velocity data. The TPU, using group broadcast messages on the TETRA radio network, provides GPS Reference Receiver data to the detection device.

The DCI as a system includes a GPS and therefore does not require nor utilize any GPS information from the Detection Device. Both the DCI and the TPU provide the Detection Device with initialization data, GPS Reference Receiver data, and operational commands.

At this time the DCI to SMODIM interface has not been implemented and only the TPU is compatible with SMODIM systems.



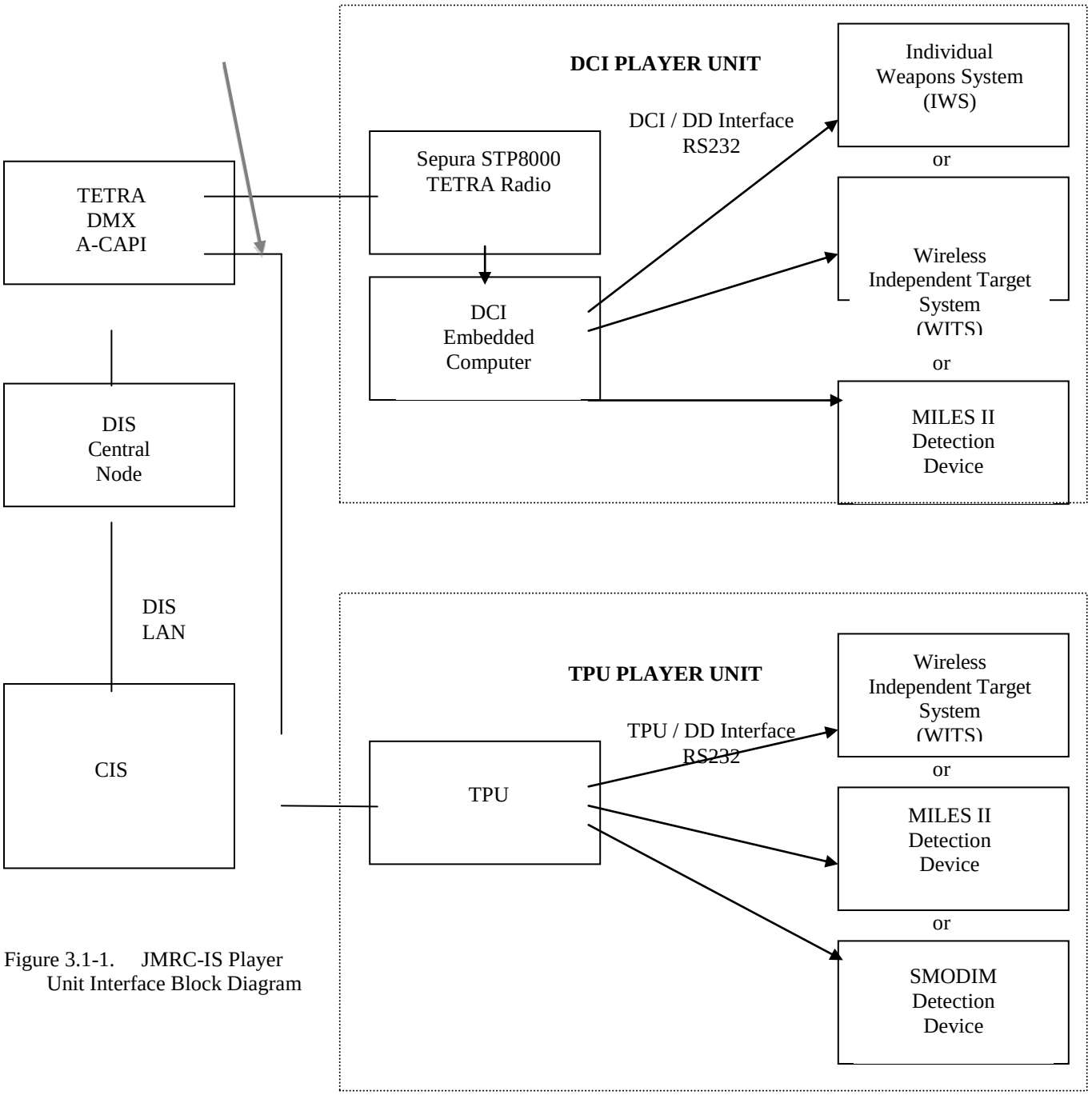


Figure 3.1-1. JMRC-IS Player Unit Interface Block Diagram

3.2 JMRC-IS Interface Design

3.2.1 JMRC-IS Data Communications Interface (DCI) Interface Diagram.

The interface between the Data Communications Interface (DCI) and the MILES II Vehicle Detection Device or Personal Detection Device (VDD or PDD) is an integral two-way digital data link. This interface transmits real-time

Detection Device control data from the DCI to the Detection Device via DCI-MILES, and receives Detection Device event and status data at the DCI from the Detection Device via MILES-DCI using RS-232. Messages passed from the DCI to the Detection Device contain initialization data, AWE Commands, and operational commands. Messages passed from Detection Device to DCI contain MILES II Event Data. The MILES II function of the Detection Device handles all communication between the Detection Device and the DCI.

3.2.2 JMRC-IS DCI Physical Interconnection.

Figures 3.2.2-1 and 3.2.2-2 show the cables that connect the JMRC DCI to the PDD and the JMRC DCI to the VDD, respectively.

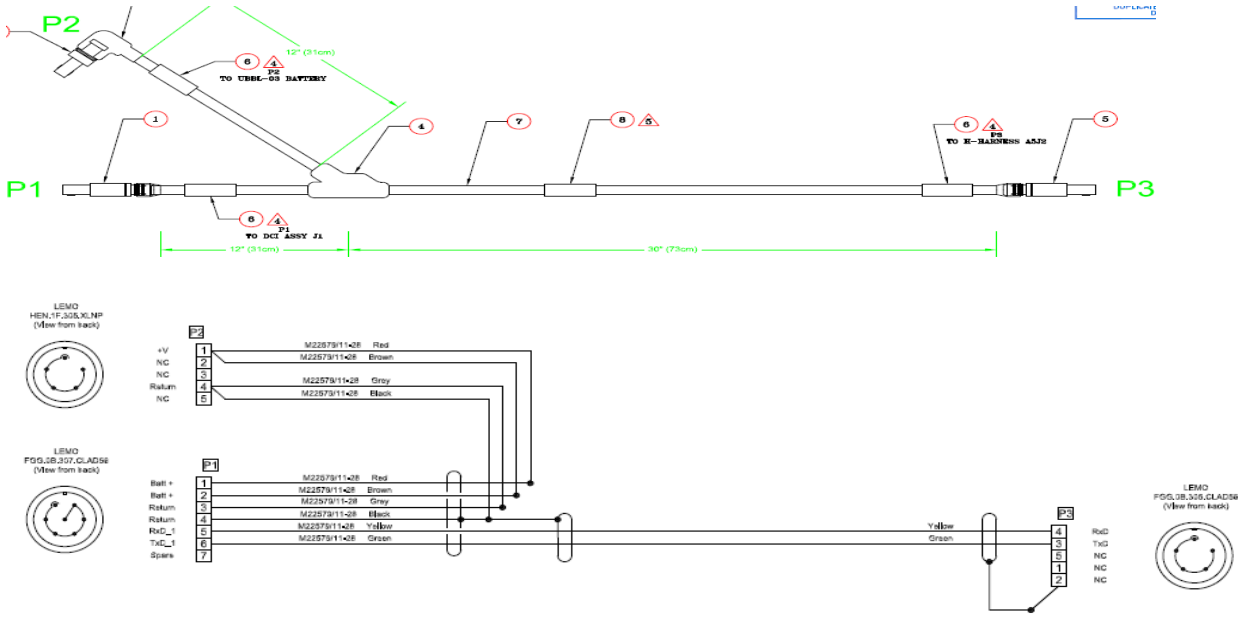


Figure 3.2.2-1. JMRC-IS DCI/IWS Interconnection Diagram*

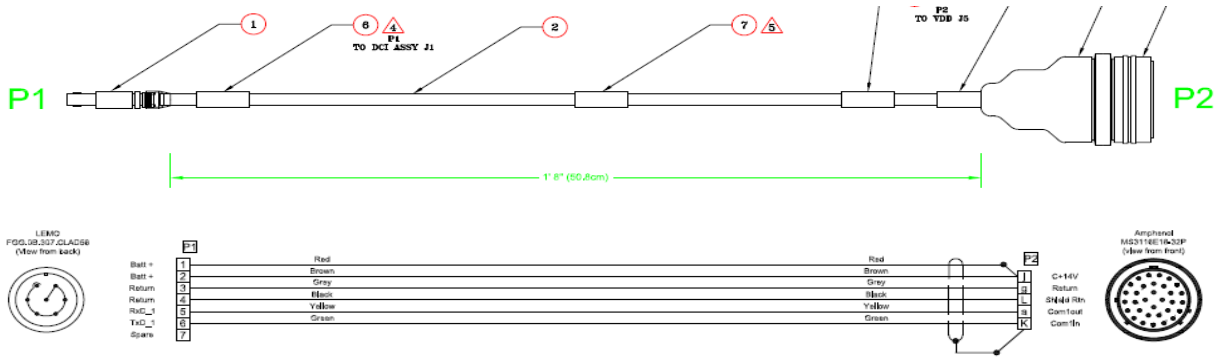


Figure 3.2.2-2. JMRC-IS DCI/VDD Interconnection Diagram*

3.2.3 JMRC-IS DCI Electrical Interface

The functions and characteristics of the JMRC-IS interface signals are defined below. The term "complementary metal-oxide semiconductor (CMOS) Logic" refers to positive true logic levels at CMOS voltages where a logical 0 or low is represented by a voltage level of 0V to 0.4V and a Logical 1 or high is represented by a voltage level of 4.0V to 5.0V.

Signal	Type	Function
Power	+15.2VDC	Power directly from battery pack for DCI.
Power	+11 to +28VDC	For DCI/VDD (DCI), power from conditioned/converted vehicle power on VDD power supply board when vehicle power is present. When vehicle power is not present, power from backup battery.
RXD - DCE RS-232	RS-232C	DCE. Spare RS-232 transmit port (DCI transmit) used for test and growth.
TXD - DCE RS-232	RS-232C	DCE. Spare RS-232 receive port (DCI receive) used for test and growth.

Table 3.2.3-1 JMRC-IS DCI -Electrical Interface

3.3 JMRC-IS DCI Power Conditioning Module Switching Frequency Requirements.

The DCI Power Conditioning Module DC-DC conversion switching frequencies must be chosen to not interfere with the operation of the Detection Devices. The Detection Device Mine Effects Simulator (MES) receiver operates around 80 kHz and the VDD power supply board conversion switching frequencies are around 130 kHz and 600 kHz.

The DCI switching fundamental frequency should not fall within the following ranges:

83.35 kHz $\pm$10 kHz (also the DCI switching frequency 2nd harmonic should not fall within this range)

135 kHz $\pm$15 kHz

600 kHz $\pm$50 kHz

The difference of the DCI switching frequency from 135 kHz $\pm$15 kHz should not fall within 83.35 kHz $\pm$10 kHz. The difference of the DCI switching frequency from 600 kHz $\pm$50 kHz should not fall within 83.35 kHz $\pm$10 kHz.

3.3.1 JMRC-IS Terminal Player Unit (TPU) Interface Diagram.

The interface between the Terminal Player Unit (TPU) and the MILES Detection Device (VDD) is an integral two-way digital data link. This interface transmits real-time Detection Device control data from the TPU to the Detection Device via TPU-MILES, and receives Detection Device event and status data at the TPU from the Detection Device via MILES-TPU. Messages passed from the TPU to the Detection Device contain initialization data, and operational commands. Messages passed from Detection Device to TPU contain MILES Event Data. The MILES function of the Detection Device handles all communication between the Detection Device and the TPU.

The legacy Production SMODIM interface conforms to the MILES VDD configuration. Figure 3.3.1-1 shows the Legacy TPU/DD interface block diagram for SMODIM. The SMODIM includes an antenna and cable that is used by the TPU for RF communication; the TPU interfaces to this antenna/cable via TPU-ANTENNA.

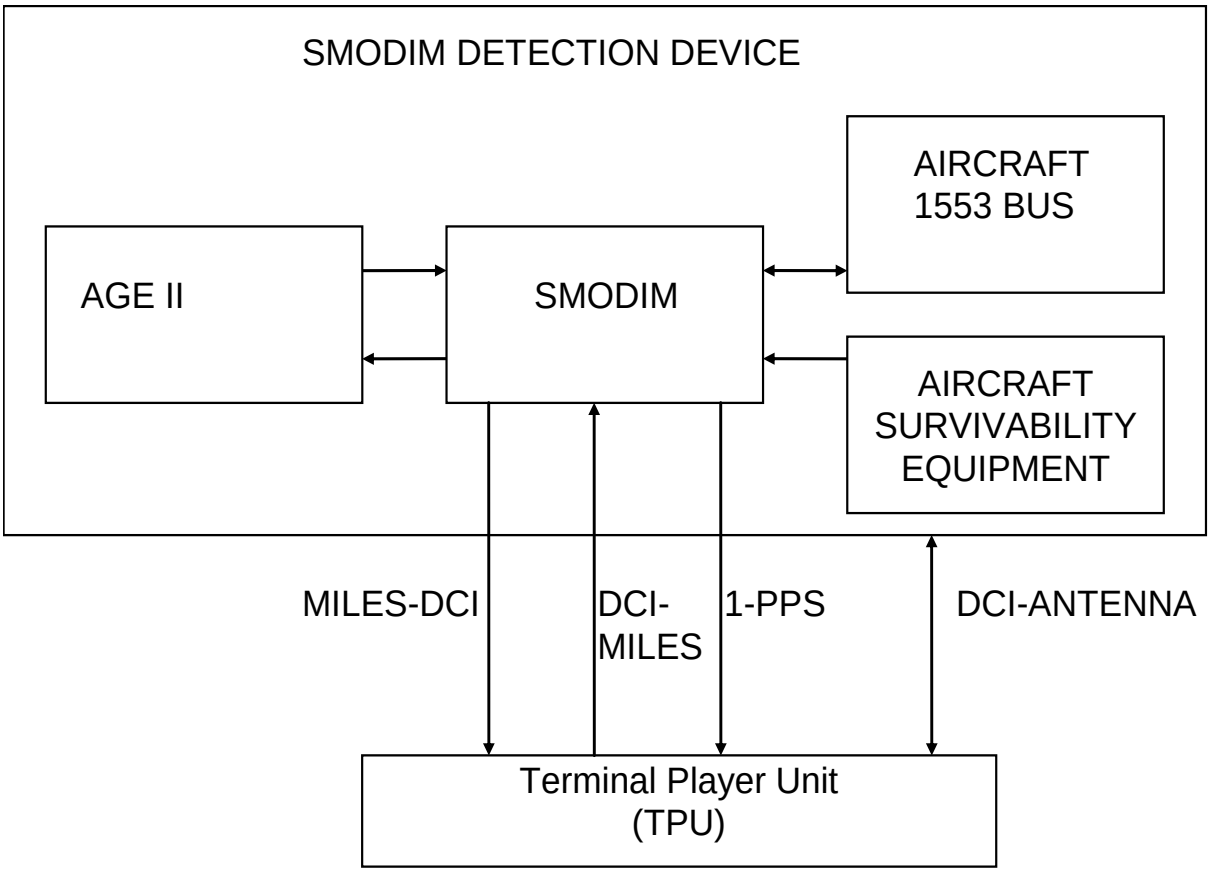


Figure 3.3.1-1. JMRC-**IS Legacy TPU/DD Interface Diagram for SMODIM**

3.3.2 Physical Interconnection

Figures 3.3.2-1 shows the cables that connect the Legacy JMRC TPU to the VDD. Figure 3.3.2-2 shows the cables that connect the Legacy JMRC TPU to SMODIM.

The pin assignments for the D38999/26WB35PN connector on the Legacy JMRC TPU:

Pin Number	Signal Name
1	1-PPS
2	Monitor
3	TPU-MILES RS-232 (for VDD)
4	Spare 1
5	MILES-DCI
6	Power RTN
7	Power (PDD Battery Power, VDD Conditioned Power)
8	Signal RTN
9	Spare 2
10	Spare 2
11	Spare 3
12	RXD - DCE RS-232
13	TXD - DCE RS-232

The pin assignments for the MS3116F18-32P on the SMODIM are listed below.

Pin Number	Signal Name
A	Spare
B	Spare
C	Spare
D	Spare
E	Spare
F	Spare
G	Spare
H	Spare
J	Spare
K	DCI-MILES
L	Signal Return
M	Spare
N	Spare
P	Spare
R	Spare
S	Spare
T	Spare
U	Spare
V	Spare
X	Spare
X	Spare
Y	Spare
Z	1 PPS

a	MILES-DCI
b	Spare
c	Spare
d	Spare
e	Spare
f	Spare
g	Power Return
h	Monitor
j	Power

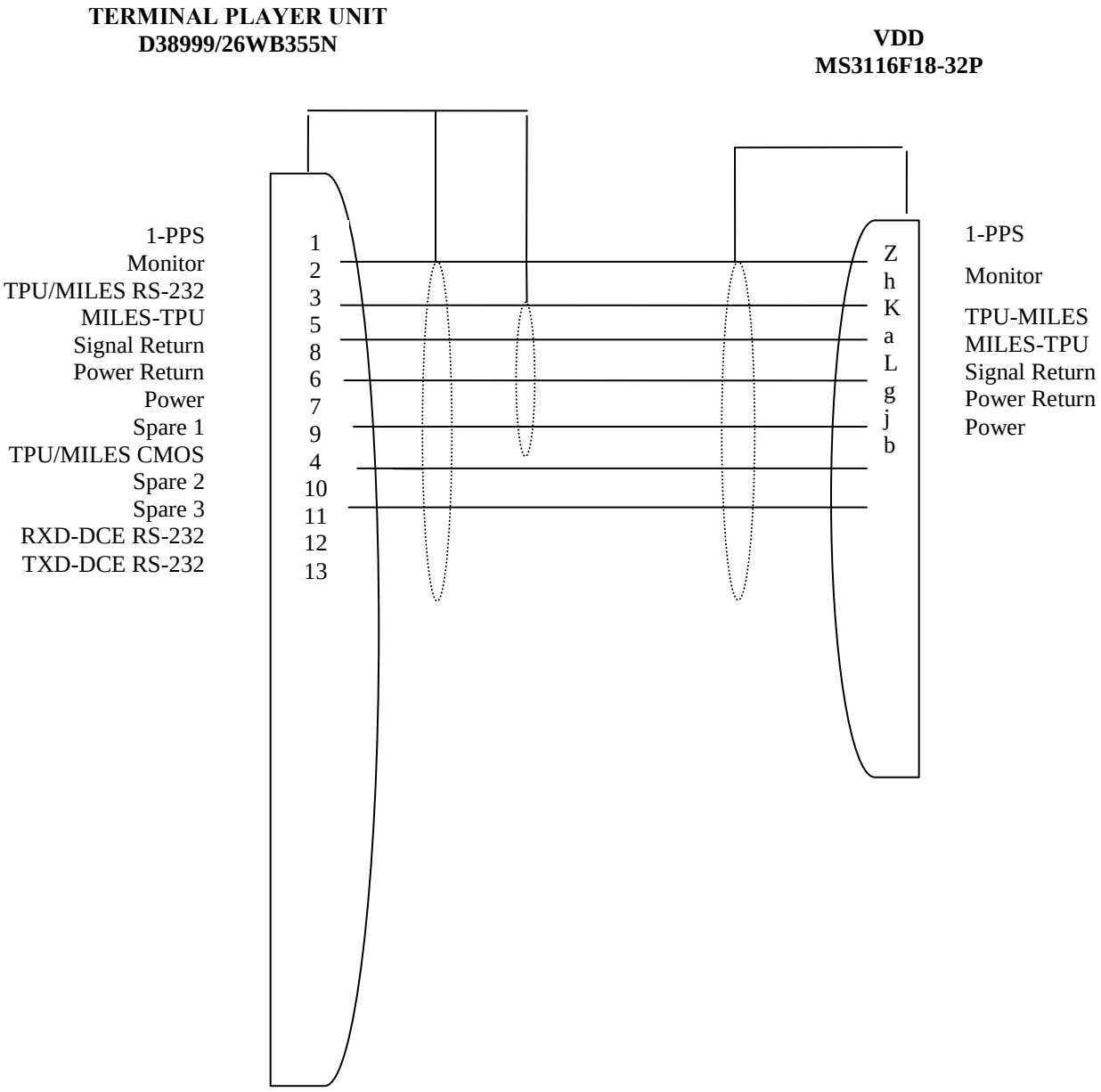


Figure 3.3.2-1 JMRC-IS Legacy TPU/VDD Interconnection Diagram

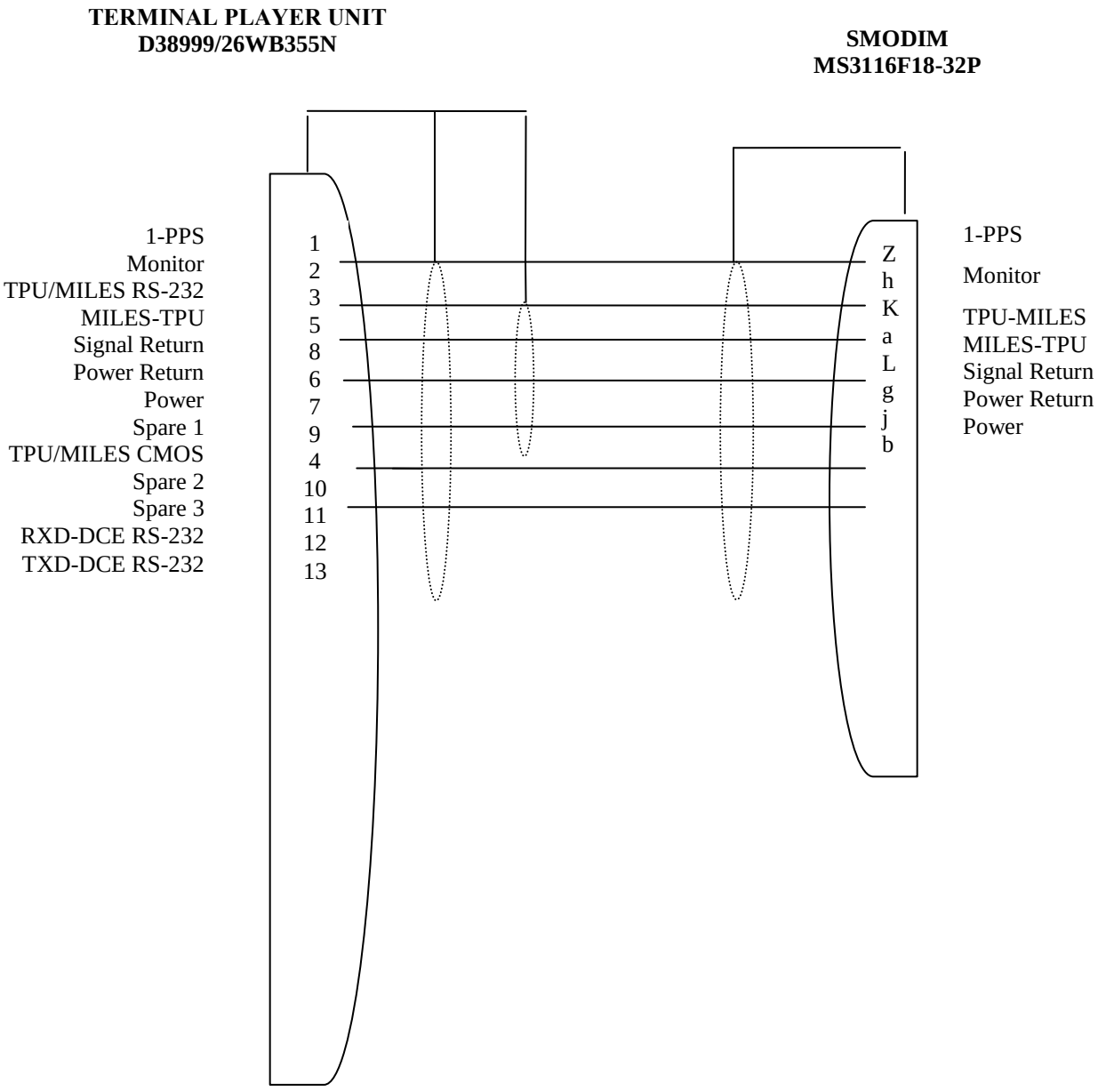


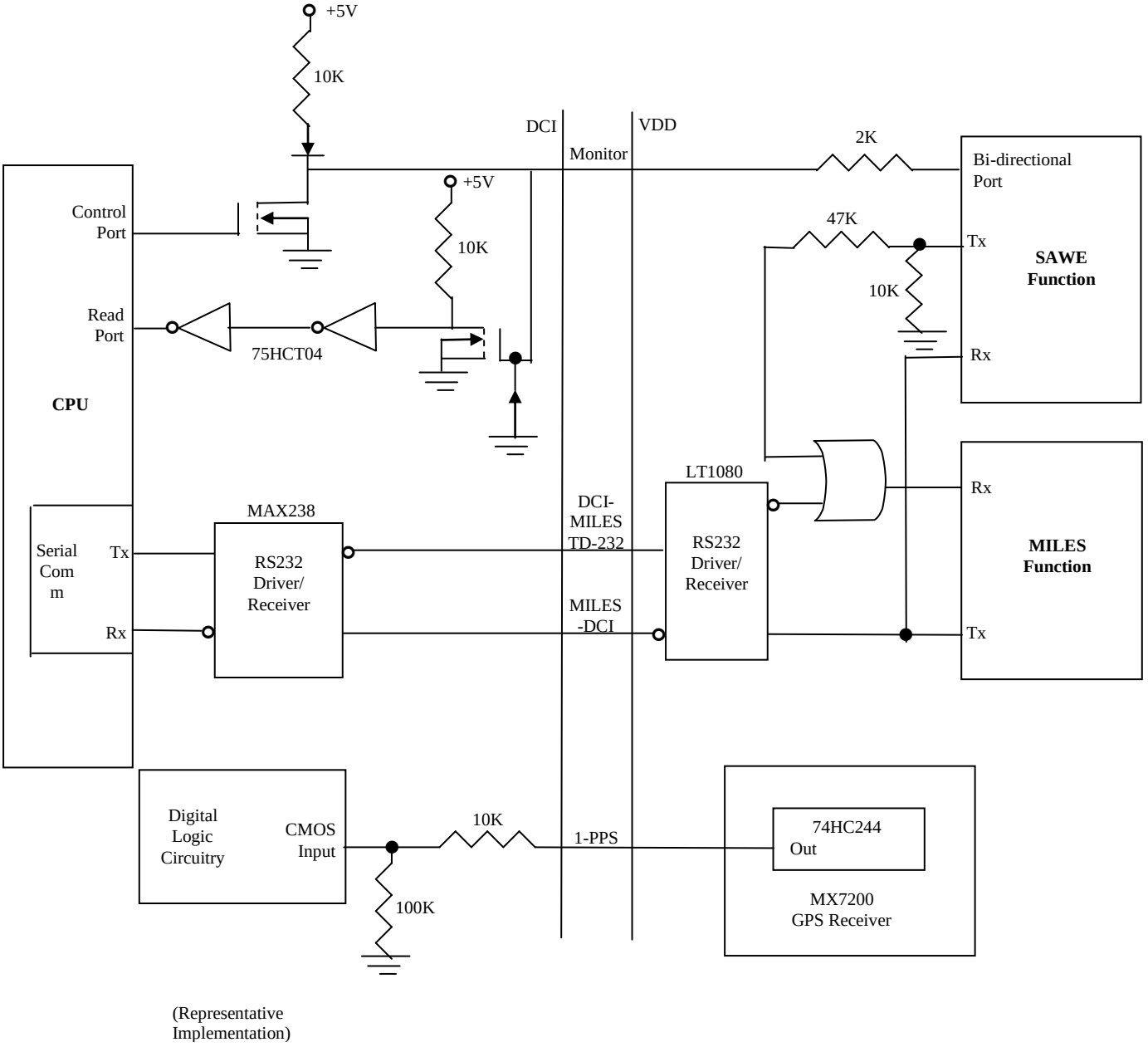
Figure 3.3.2 -2 JMRC-IS Legacy TPU/SMODIM Interconnection Diagram *

3.3.3 Electrical Interface

The Legacy TPU/VDD electrical interfaces for JMRC are shown in figure 3.3.3-1. The functions and characteristics of the JMRC-IS interface signals are defined below. The term “CMOS Logic” refers to positive true logic levels at CMOS voltages where a logical 0 or low is represented by a voltage level of 0V to 0.4V and a Logical 1 or high is represented by a voltage level of 4.0V to 5.0V.

Signal	Type	Function
1-PPS	CMOS Logic High=5Volts Low =0 Volts	One pulse-per-second, sourced from GPS Receiver. Allows TPU to initialize its TDMA timing.
Monitor	CMOS Logic High = 8.5 Volts Low = 5 Volts	Indicates that the serial bus is busy when the TPU is transmitting to MILES.
TPU-MILES RS-232	RS-232C High = -6 Volts Low = +6Volts	Used by TPU/VDD, serial bus for 9600 baud transmission from TPU to MILES. Used by TPU/SMODIM, serial bus for 9600 baud transmission from TPU to SMODIM.
MILES-TPU	RS-232C High = -6 Volts Low = +6 Volts	Used by TPU/VDD, serial bus for 9600 baud transmission from MILES to TPU. Used by TPU/SMODIM, serial bus for 9600 baud transmission from SMODIM to DCI.
Power RTN	RTN	VDD Power supply return for TPU/VDD. SMODIM Power Supply return for TPU/SMODIM.
Power	+11 to +15VDC	For TPU/VDD (TPU/SMODIM), power from conditioned/converted vehicle power on VDD (SMODIM) power supply board when vehicle power is present. When vehicle power is not present, power from backup battery.
Signal RTN	RTN	Signal return for serial bus.
Spare 1	-	Not used (GPS fix enable)
Spare 2	-	Not used
Spare 3	-	Not used
RXD - DCE RS-232	RS-232C	DCE. Spare RS-232 transmit port (DCI transmit) used for test and growth.
TXD - DCE RS-232	RS-232C	DCE. Spare RS-232 receive port (DCI receive) used for test and growth.

Table 3.3.3-1 JMRC-IS Legacy TPU-Electrical Interface



(Representative
Implementation)

Figure 3.3.3-1 JMRC-IS Legacy TPU/VDD ELECTRICAL INTERFACE DIAGRAM

3.4 VDD and SMODIM Power Supply Requirements

The VDD and SMODIM supply DC power to the TPU across the interface cable. The requirements for the VDD and SMODIM to TPU power are listed below.

Maximum Voltage (no load)	+15.00 VDC
Minimum Voltage	+11.00 VDC
DC-DC Conversion Switching Frequencies	135 kHz ±15 kHz, 600 kHz ±50 kHz
Maximum Ripple & Spikes	100 mV, Peak to Peak
Maximum Voltage Rise Time	5.0 milliseconds (does not include switch or battery contact bounce) operating into a 10 ohm load
Maximum Output Current	Limited by 1.5 amp slow blow fuse

Figure 3.4-1 DC Power

3.5 TPU Power Conditioning Module Switching Frequency Requirements

a. The TPU Power Conditioning Module DC-DC conversion switching frequencies must be chosen to not interfere with the operation of the Detection Devices. The Detection Device Mine Effects Simulator (MES) receiver operates around 80 kHz and the VDD power supply board conversion switching frequencies are around 130 kHz and 600 kHz.

b. The DCI switching fundamental frequency should **not** fall within the following ranges:
83.35 kHz ±10 kHz (Additonally, the DCI switching frequency 2nd harmonic should not fall within this range)
135 kHz ±15 kHz
600 kHz ±50 kHz

c. The difference of the DCI switching frequency from 135 kHz ± 15 kHz should not fall within 83.35 kHz ± 10 kHz. The difference of the DCI switching frequency from 600 kHz ± 50 kHz should not fall within 83.35 kHz ± 10 kHz.

Ripple on the external 5.0 volt supply for the SMODIM units requiring it shall not exceed 0.6 Vrms over the frequency range of 1.65 to 8.0 kHz. Outside this range all supplies may reach the limits of MIL-STD-461C, Part 2.

3.5.1 SMODIM Constraints

The SMODIM system is rated to withstand electrical field intensities as follows:

14 kHz to 2 MHz	10 V/m
2 MHz to 30 MHz	20 V/m
30 MHz to 2 GHz	50 V/m

In the region from 30 to 200 MHz, exposure to fields in excess of 25 V/m may affect the performance of the internally generated voice cues. Other performance parameters remain unaffected up to the above tabulated limits

3.6 JMRC-IS DCI/TPU Communications Protocol.

The DCI/TPU to Detection Device interface uses serial communications protocol with 1 start bit, 1 stop bit, 8 data bits and no parity. The data transfer rate is at 9600 baud. The Monitor signal Logic levels are defined in section 3.2.3. A CMOS logic low on the monitor line means that the DCI/TPU device is currently transmitting to Detection Device. The DCI follows the steps listed below before transmitting to the Detection Device:

1. Check level of monitor line until a high level is read to ensure that the bus is not in use.

2. Assert monitor line to a low level.

3. Transmit entire message to Detection Device.

4. Release monitor line, returning it to a high level.

3.7 JMRC-IS Message Formats.

The interface message formats are the same for DCI and TPU devices and have three basic format types: basic data or command message format, Event Command, and Event Report format. Detailed descriptions of all the messages are provided in Appendix A through D.

3.7.1 JMRC-IS Basic Message Format.

The basic data or command message is used for both DCI/TPU to DD and DD to DCI/TPU communication and is one of the following types.

DD to DCI/TPU	DCI/TPU to DD
Acknowledge	Almanac Data*
Almanac Data Request*	Ammo Level Request
Ammo Level	Ammo Level Set
Differential Data Request*	CIS Event Commands
Ephemeris Data Request*	Differential Data*
Event Reports	Ephemeris Data*
Missed Event Reports	Local time
Position	Repeat Command
Set Initial Position, Time and Date	Request Missed Events
Unit Configuration	Set Initial Position, Time and Date
UTC Date and time	Set Vehicle Type
Velocity	Southwest Reference Corner
	UHF OFF
	UHF ON
	Unit Configuration Request
	UTC Time Start
	UTC Time Stop

*Not used by the DCI.

The basic message has the following format.

Sync	(1 byte)
Message ID	(1 byte)
Size	(1 byte)
Data	(0 to 250 bytes)
Checksum	(2 bytes)

Field	Description
Sync	Hex value = BB. Tells Detection Device SAWE/MILES II receiver and the DCI that the incoming message is communication between the DCI and MILES II, distinguishing it from communication between SAWE and MILES II.
Message ID	Hex value = 00 to 4A Identifies message type.

Size	Hex value = 05 to FF. Tells receiver the total length of the incoming message, includes sync and checksum bytes.
Data	The data block varies according to the message type.
Checksum	The checksum is computed by adding the bytes starting with the sync byte and ending with the last data byte. The most significant byte is sent first.

3.7.2 JMRC-IS Event Command Message Format.

An Event Command is sent to the Detection Device. If appropriate, the Detection Device responds to the command by initiating the standard audio/visual cues corresponding to the event type. The Detection Device also stores an event and reports it to the DCI/TPU, if necessary. DCI/TPU Event Commands are initiated by the DCI/TPU, or other external means, and forwarded through the DCI/TPU to the DD. The DCI/TPU Event Command message has the following structure:

Sync	(1 byte)
Message ID	(1 byte)
Size	(1 byte)
Event Code	(1 byte)
Event Subcode	(1 byte)
Checksum	(2 bytes)

Field	Description
Sync	Hex value = BB. Tells Detection Device SAWE/MILES II receiver and the DCI that the incoming message is communication between the DCI and MILES II, distinguishing it from communication between SAWE and MILES II.
Message ID	Hex value = 33. Identifies message type.
Size	Hex value = 07. Tells receive the total length of the incoming message, includes sync and checksum bytes. Total length of a CIS Event Command is 7 bytes, including sync and checksum bytes.
Event Code	Specifies command type.
Event Subcode	Varies according to command type. May contain weapon type or BIT status results.
Checksum	The checksum is computed by adding the bytes starting with the sync byte and ending with the last data byte. The most significant byte is sent first.

3.7.3 JMRC-IS Event Report Message Format.

When an event occurs the Detection Device stores an event record and send an event report to the DCI/TPU, if necessary. The event report message has the following structure.

Sync	(1 byte)
Message ID	(1 byte)
Size	(1 byte)
Event Number	(2 bytes)
Event Code	(1 byte)
Event Subcode	(1 byte)
Zone of Impact	(1 byte)
Position	(4 bytes)
Player ID	(2 bytes)
Time	(4 bytes)
HUTT Position	(1 byte)
Checksum	(2 bytes)

Field	Description
Sync	Hex value = BB. Tells Detection Device SAWE/MILES II receiver and the DCI that the incoming message is communication between the DCI and MILES II, distinguishing it from communication between SAWE and MILES II.
Message ID	Hex value = 33. Identifies message type.
Size	Hex value = 15. Total length of an event report message is 21 bytes, including sync and checksum bytes.
Event Number	Index indicating the number of the event report. Unsigned integer. Most significant byte is sent first.
Event Code	Identifies type of event report. (see Table A-2).

JMRC-IS Event Report Message Format (continued)

Field	Description
Event Subcode	Varies according to event report type (see Table A-2).

	Possible contents are: for Direct fire events - MILES weapon code. for Indirect fire events - Weapon type (artillery/mortar, RF-mine, chemical, nuclear, MES). for BIT failure event - SAWE BIT failures. for Time/Sync Rollover event - year.
Zone of Impact	Varies according to event report type (see Table A-2). Spare except for: Direct fire events - zone of impact. (VDD only, not initiated by CIS). BIT failure event - SAWE/MILES IIBIT failures.
Position	Position in Local Grid format as received from GPS.
Player ID	CIS/DCI initiated events (except Time/Sync Rollover) - BBBB (hex). Non-CIS/DCI initiated events - varies according to event report type (see Table A-2).
Time	Event time-tag. Includes day of week, hours, minutes, and seconds and tenths of second. BCD format.
HUTT Position	For turreted VDD's - Hull to turret position, relative position in 45^{o} increments. For non-turreted VDD's - invalid. For PDD's - spare.
Checksum	The checksum is computed by adding the bytes starting with the sync byte and ending with the last data byte. The most significant byte is sent first.

3.8 JMRC-IS Message Protocols and Timing.

The DCI or TPU communicates with the MILES II function of the Detection Device. DCI/TPU and the Detection Device always check the sync field of the incoming message. The value contained in the sync field distinguishes MILES II only messages from MILES II to DCI/TPU messages. The DCI and TPU only process messages with a 'BB' (hex) in the sync field.

The DD is in the un-instrumented mode prior to receiving a Unit Configuration Request Message. After receiving a Unit Configuration Request Message, the DD is in the Instrumented Mode.

MILES II does not accept acknowledges from DCI/TPU. MILES II acknowledges messages it has received from DCI/TPU. The DCI/TPU can request MILES II to repeat the last message it sent if the DCI/TPU determines that there is a discrepancy with the checksum or the message length of the received message.

Messages between the DCI/TPU and the Detection Device that are expected to occur in certain sequences and that may require special timing are defined in the following subparagraphs.

3.8.1 JMRC-IS DCI Time Out Sequence.

The time out sequence for expected acknowledge or response messages from the Detection Device is as follows:

1. DCI sends a message to the DD.
2. DCI waits 10 seconds for acknowledge or response message from DD.
3. If no response, DCI sends message again.
4. DCI repeats steps 2 and 3 for a maximum of 3 minutes or until response from DD.
5. If no response, DCI sends a Unit Configuration Request message to the DD.
6. DCI waits 10 seconds for Unit Configuration message from DD.
7. If no response, DCI performs BIT and sends BIT Event Command to DD.
8. DCI waits 60 seconds for an acknowledge or a BIT Failure Event Report from DD.
9. If no response, DCI informs CIS that it has no communication with the DD.

3.8.2 JMRC-IS TPU Time Out Sequence.

The time out sequence for expected acknowledge or response messages from the Detection Device is as follows:

1. TPU sends a message to the DD.
2. TPU waits 10 seconds for acknowledge or response message from DD.
3. If no response, TPU sends message again.
4. TPU repeats steps 2 and 3 for a maximum of 3 total attempts to send the message.
5. If no response, TPU sends a Unit Configuration Request message to the DD.
6. DCI waits 10 seconds for Unit Configuration message from DD.
7. If no response, TPU performs BIT and sends BIT Event Command to DD.
8. TPU waits 60 seconds for an acknowledge or a BIT Failure Event Report from DD.
9. If no response, TPU informs CIS that it has no communication with the DD.

3.8.3 JMRC-IS Power On Sequence.

3.8.3.1 JMRC-IS DCI Power On.

After power is applied, the DD and DCI perform BIT. The DD powers up in Uninstrumented Mode. The DCI waits at least 30 seconds to allow the DD to perform BIT and then initiates, in the order indicated the following exchange of Normal Operation Message Sequences (See 3.8.6 JMRC-IS Normal Operation Message Sequences).

1. Unit Configuration Request (DCI --> DD)
2. BIT Event Command (DCI --> DD)
3. UTC Time Stop (DCI --> DD)

3.8.4 JMRC-IS DCI Initialization.

During DCI Initialization, Normal Operation Message Sequences are executed. Unless otherwise indicated, the order of execution is not important and one sequence need not be completed before another is started. The Initialization described below applied to the system initialization task of player definition (assignment of PDD's, VDD's equipment to operational units) performed at the CIS prior to the start of a training mission.

3.8.4.1 JMRC-IS DCI Centralized Mode Initialization.

The following normal operation message sequences are executed during Centralized Mode Initialization after the Power On Sequence (See 3.8.6 JMRC-IS Normal Operation Message Sequences).

1. Initialize CIS Event Command (DCI --> DD)
2. BIT CIS Event Command (DCI --> DD)
3. UHF Off (DCI --> DD)
4. Set Vehicle Type (vehicle players only) (CIS --> DD)*
5. Ammo Level Set (vehicle players only) (CIS --> DD)*
6. Set Vehicle Type (vehicle players only) (CIS --> DD)*
7. Ammo Level Request (vehicle players only) (CIS --> DD) *
8. Unit Configuration Request (CIS --> DD)

NOTES:

* Not sent to man-pack detection devices, ie IWS.

3.8.4.2 JMRC-IS TPU Power On.

After power is applied, the DD and TPU perform BIT. The DD powers up in un-instrumented Mode. The TPU waits at least 90 seconds to allow the DD to perform BIT and then initiates, in the order indicated, the following exchange of Normal Operation Message Sequences (See 3.8.6 JMRC-IS Normal Operation Message Sequences).:

1. Unit Configuration Request (TPU --> DD)*
2. BIT Event Command (TPU --> DD)
3. UTC Time Start (TPU --> DD)
4. UTC Time Stop (TPU --> DD) **

The TPU is now ready to establish RF link communications with the Central Node.

NOTES:
* Byte 4 = 1E (hex) in the Unit Configuration Request to prevent the GPS from turning off. The DD cannot report position during BIT. Occasionally the Unit Configuration Request is not sent from the TPU to the Detection Device.
** The TPU waits to receive five consecutive UTC Date and Time messages with the data set to accurate time before sending the UTC Time Stop.

3.8.5 JMRC-IS TPU Initialization.

During JMRC Initialization, Normal Operation Message Sequences are executed. Unless otherwise indicated, the order of execution is not important and one sequence need not be completed before another is started. The Initialization described below applied to the system initialization task of player definition (assignment of VDD's equipment to operational units) performed at the CIS prior to the start of a training mission.

3.8.5.1 JMRC-IS TPU Centralized Mode Initialization.
The following Normal Operation Message Sequences are executed during Centralized Mode Initialization after the Power On Sequence (See 3.8.6 JMRC-IS Normal Operation Message Sequences).

Initialize CIS Event Command (TPU --> DD)
BIT CIS Event Command (TPU --> DD)
UHF Off (TPU --> DD)
Set Local Time (CIS --> DD)
Normal Kill/Normal SAWE RTCA Mode Event Command (TPU --> DD)
Set Initial Position, Time and Date (includes Southwest Reference Corner) (TPU --> DD)
Unit Configuration Request (with desired update rate)
Set Vehicle Type (vehicle players only) (CIS --> DD)
Ammo Level Set (vehicle players only) (CIS --> DD)
Set Vehicle Type (vehicle players only) (CIS --> DD)
Ammo Level Request (vehicle players only) (CIS --> DD)

NOTE: Commands can be sent multiple times.

3.8.6 JMRC-IS Normal Operation Message Sequences.

The following sequences occur during normal operation. The DD may not immediately respond if running BIT or otherwise occupied. If the DD does not respond within 10 seconds, the DCI/TPU repeats the message.

Sequence		Direction	Timing Requirement
1.	Almanac Data	DCI --> DD	- NR
2.	Acknowledge	DCI <-- DD	- within 10 seconds
1.	Almanac Data Request	DCI <-- DD	- NR
2.	Almanac Data	DCI --> DD	- NR
3.	Acknowledge	DCI <-- DD	- within 10 seconds
1.	Ammo Level Request	DCI --> VDD	- NR
2.	Ammo Level Report	DCI <-- VDD	- within 10 seconds
1.	Ammo Level Set	DCI --> VDD	- NR
2.	Acknowledge	DCI <-- VDD	- within 10 seconds
3.	Set Vehicle Type	DCI --> VDD	- NR
4.	Acknowledge	DCI <-- VDD	- within 10 seconds

5.	Vehicle Init Event Report	DCI <-- VDD	-	NR
1.	BIT Event Command	DCI --> DD	-	NR
2.	Acknowledge	DCI <-- DD	-	within 10 seconds
3.	BIT Failure Event Report	DCI <-- DD	-	occurs only if a DD BIT failure was detected
1.	Chemical Contamination Event Command	DCI --> VDD	-	NR
2.	Acknowledge	DCI <-- VDD	-	within 10 seconds
3.	Chemical Contamination Event Report	DCI <-- VDD	-	NR
1.	Communications Kill Event Command	DCI --> VDD	-	NR
2.	Acknowledge	DCI <-- VDD	-	within 10 seconds
3.	Communications Kill Event Reports	DCI <-- VDD	-	NR
1.	Firepower Kill Event Command	DCI --> VDD	-	NR
2.	Acknowledge	DCI <-- VDD	-	within 10 seconds
3.	Firepower Kill Event Report	DCI <-- VDD	-	NR
1.	Hit Event Command	DCI --> VDD	-	NR
2.	Acknowledge	DCI <-- VDD	-	within 10 seconds
3.	Hit Event Report	DCI <-- VDD	-	NR

JMRC-IS Normal Operation Message Sequences (continued)

Sequence		Direction	Timing Requirement
1.	Initialize Event Command	DCI --> DD	- NR
2.	Acknowledge	DCI <-- DD	- within 10 seconds
3.	CIS Init Event Report	DCI <-- DD	- NR
1.	Kill Event Command	DCI --> DD	- NR
2.	Acknowledge	DCI <-- DD	- within 10 seconds
3.	Kill Event Report	DCI <-- DD	- NR
1.	Miss Event Command	DCI --> DD	- NR
2.	Acknowledge	DCI <-- DD	- within 10 seconds
3.	Miss Event Report	DCI <-- DD	- NR
1.	Mobility Kill Event Command	DCI --> VDD	- NR
2.	Acknowledge	DCI <-- DD	- within 10 seconds
3.	Mobility Kill Event Report	DCI <-- DD	- NR
1.	Reset Event Command	DCI --> DD	- NR
2.	Acknowledge	DCI <-- DD	- within 10 seconds
3.	Reset Event Report	DCI <-- DD	- NR
1.	No-Kill SAWE RTCA Mode Event Command	DCI --> DD	- NR
2.	Acknowledge	DCI <-- DD	- within 10 seconds
3.	No-Kill SAWE RTCA Event Report	DCI <-- DD	- NR
1.	Normal SAWE RTCA Mode Event Command	DCI --> DD	- NR
2.	Acknowledge	DCI <-- DD	- within 10 seconds
3.	Normal SAWE RTCA Event Report	DCI <-- DD	- NR
1.	Resurrect Event Command	DCI --> DD	- NR
2.	Acknowledge	DCI <-- DD	- within 10 seconds
3.	Resurrect by SLID Event Report	DCI <-- DD	- NR
1.	Controller Key Detect Event Report	DCI <-- DD	- NR
2.	Unit Configuration Request	DCI --> DD	- NR
3.	Unit Configuration Report	DCI <-- DD	- within 10 seconds
1.	Differential Data Request	DCI <-- DD	- NR
2.	Differential Data	DCI --> DD	- within 10 seconds
3.	Acknowledge	DCI <-- DD	- within 10 seconds

JMRC-IS Normal Operation Message Sequences (continued)

Sequence		Direction	Timing Requirement
1.	Ephemeris Data Request	DCI <-- DD	- NR
2.	Ephemeris Data	DCI --> DD	- within 1 minute
3.	Acknowledge	DCI <-- DD	- within 10 seconds
1.	Set Initial Position, Time and Date	DCI --> DD	- NR
2.	Acknowledge	DCI <-- DD	- within 10 seconds
3.	Reference Corner Event Report	DCI <-- DD	- NR
1.	Position	DCI <-- DD	- once every N seconds
2.	Velocity	DCI <-- DD	- once every N seconds, immediately following position location message (N defined in Unit Configuration Request message)
1.	Request Missed Events	DCI --> DD	- NR
2.	Missed Events Report	DCI <-- DD	- within 10 seconds
1.	Set Initial Position, Time and Date	DCI --> DD	- NR
2.	Acknowledge	DCI <-- DD	- NR
3.	Reference Corner Event Report	DCI <-- DD	- NR
1.	Set Local Time	DCI --> DD	- NR
2.	Acknowledge	DCI <-- DD	- within 10 seconds
3.	Time/Sync Rollover Event Report	DCI <-- DD	- NR
1.	Set Vehicle Type	DCI --> VDD	- NR
2.	Acknowledge	DCI <-- VDD	- within 10 seconds
3.	Init by SLID Event Report	DCI <-- VDD	- NR
1.	UHF Off	DCI --> DD	- NR
2.	Acknowledge	DCI <-- DD	- within 10 seconds
1.	UHF On	DCI --> DD	- NR
2.	Acknowledge	DCI <-- DD	- within 10 seconds
1.	Unit Configuration Request	DCI --> DD	- NR
2.	Unit Configuration Report	DCI <-- DD	- within 10 seconds
1.	UTC Time Start	DCI --> DD	- NR
2.	Acknowledge	DCI <-- DD	- within 10 seconds
3.	UTC Date and Time	DCI <-- DD	- within 0.5 seconds from start of the UTC second reported in the message, repeated once every second.
4.	UTC Time Stop	DCI --> DD	- upon receipt of valid UTC time
5.	Acknowledge	DCI <-- DD	- within 10 seconds

4. Acronyms and Abbreviations.

AAC	Anti-Aircraft
AGES	Air-to-Ground Engagement System
ASE	Aircraft Survivability Equipment
AWE	Area Weapon Effects
BCD	Binary Coded Decimal
BIT	Built-In-Test
CCH	Close Combat Heavy
CIS	Core Instrumentation System
CMOS	Complementary metal-oxide semiconductor
DCI	Data Communications Interface
DCN	Digital Communication Network
DD	Detection Device
DF	Direct Fire
DOD	Department of Defense
DOP	Dilution of Precision
DPICM	Dual Purpose Improved Conventional Munitions
GFE	Government Furnished Equipment
GPS	Global Positioning System
HE	High Explosive
HOW	Handover Word
HTA	Hohenfels Training Area
HUTT	Hull to Turret
ICD	Interface Control Document
IF	Indirect Fire
Init	Initialize
Invalid	The word “INVALID” used in Message Descriptions indicates that the data transmitted is not defined for the field being described and should be ignored.
IRS	Interface Requirements Specification
JMRC	Joint Multinational Readiness Center
JMRC-IS	Joint Multinational Readiness Center Instrumentation System
LSB	Least Significant Bit
MCS	Mission Control Station
MES	Mine Effects Simulator
MILES II	Multiple Integrated Laser Engagement System II
MLRS	Multiple Launcher Rocket System
MRL	Multiple Rocket Launcher
MSB	Most Significant Bit
NR	No Requirement
NTC	National Training Center
N/A	Not Applicable
ODIM	On-Board Data Interface Module
PCB	Printed Circuit Board
PD	Point Detonating
PDD	Personal Detection Device
PPS	Pulse-per-second
PRN	Pseudo Random Noise
PU	Player Unit
RCVR	Receiver

Acronyms and Abbreviations (continued)

RDMS	Range Data Measurement Subsystem

RF	Radio Frequency
RTC	Real Time Clock
RTCA	Real Time Casualty Assessment
RTCM	Radio Technical Commission for Maritime Service
RTN	Return
SAWE	Simulated Area Weapon Effects
SLID	Serial Link Interface Device
SMODIM	Small On-Board Data Interface Module
STD	Standard
SWRC	South West Reference Corner
TBD	To Be Determined
TDMA	Time division multiple access
TPU	Terminal Player Unit
TLM	Telemetry
UDRE	User Differential Range Error
UHF	Ultra High Frequency
UTC	Universal Coordinated Time
UTM	Universal Transverse Mercator
VDD	Vehicle Detection Device
VHF	Very High Frequency
Vrms	Voltage, root mean square
VSWR	Voltage Standing Wave Ratio
XX	When used in a Message Description, “XX” indicates that a data byte can have numerous values

APPENDIX A

SAWE/SAWE/MILES II Detection Device to Data Communications
Interface Message Descriptions

Contents

Tables

Name: Acknowledge

Direction: VDD to DCI and
PDD to DCI

Description: The Detection Device sends an acknowledge to the DCI after it has received one of the messages shown in Table A-1. The single data byte contains the ID of the message that was received by the Detection Device.

Use: The Detection Device may send an acknowledgement to the DCI during initialization or normal operation in both centralized and decentralized modes.

Format:

Byte #	Hex	Field	Description
1	BB	Sync	Identifies communication between DCI and MILES II.
2	40	Message ID	Identifies message type.
3	06	Size	Total message length in bytes.
4	XX	Data	Message ID received by Detection Device, range: 02 to 4A (hex). See Table A-1.
5-6	XXXX	Checksum	Addition of bytes 1 through 4. byte 5 - Most significant byte. byte 6 - Least significant byte.

Table A-1. DCI to Detection Device Messages Requiring An Acknowledge Message Response

Message ID (HEX)	Message Type
02	Set Vehicle Type
03	Local Time
2A	UTC Time Start
2B	UTC Time Stop
2F	Almanac Data
30	Ephemeris Data
31	Differential Data
32	Initial Position, Time and Date
33	CIS Event Command
34	UHF Off
35	UHF On
4A	Ammo Level Set

Name: Almanac Data Request

Direction: VDD to DCI and
PDD to DCI

Description: The Detection Device requests almanac data from the DCI for GPS. The DCI responds with an Almanac Data message.

Use: This message is used in decentralized mode when the Detection Device is unable to receive the almanac data from the UHF link.

Format:

Byte #	Hex	Field	Description
1	BB	Sync	Identifies DCI/SAWE/MILES II communication.
2	2F	Message ID	Identifies message type.
3	05	Size	Total message length in bytes.
4-5	00EF	Checksum	Addition of bytes 1 through 3. byte 4 - Most significant byte. byte 5 - Least significant byte.

Name: Ammo Level Report

Direction: VDD to DCI

Description: The VDD sends this message to the DCI in response to an Ammo Level Request. NOTE: Ammo type 0 will contain all the rounds (i.e.: ammo types 1 through 3 will be 0) if there is no loaders or gunners display hooked up to the VDD.

Use: This message is used during initialization and normal operation in both centralized and decentralized modes.

Format:

Byte #	Hex	Field	Description
1	BB	Sync	Identifies DCI/SAWE/MILES II communication.
2	49	Message ID	Identifies message type.
3	1D	Size	Total message length in bytes.
4-11	XX...XX	Main Gun	Main gun ammunition levels. The total of the levels for ammo types 0 through 3 must be less than or equal to 9900. byte 4-5 Ammo type 0 - APDS (default), two byte integer, byte 4 = MSB. Range: 0 to 9900 (dec). byte 6-7 Ammo type 1 - HEAT, two byte integer, byte 6 = MSB. Range: 0 to 9900 (dec). byte 8-9 Ammo type 2 - unused, two byte integer, byte 8 = MSB. Range: 0 to 9900 (dec). byte 10-11 Ammo type 3 - unused, two byte integer, byte 10 = MSB. Range: 0 to 9900 (dec).
12-19		XX...XX	Missile Missile ammunition levels. The total of the levels for ammo types 0 through 3 must be less than or equal to 99. byte 12-13 Ammo type 0 - two byte integer, byte 12 = MSB. Range: 0 to 99 (dec). byte 14-15 Ammo type 1 - two byte integer, byte 14 = MSB. Range: 0 to 99 (dec). byte 16-17 Ammo type 2 - two byte integer, byte 16 = MSB. Range: 0 to 99 (dec). byte 18-19 Ammo type 3 - two byte integer, byte 18 = MSB. Range: 0 to 99 (dec).

Format (Ammo Level - Continued)

Byte #	Hex	Field	Description
20-27	XX	Coax	Coax ammunition levels. The total of the levels for ammo types 0 through 3 must be less than or equal to 9900.
		byte 20-21	Ammo type 0 - two byte integer, byte 20 = MSB. Range: 0 to 9900 (dec).
		byte 22-23	Ammo type 1, two byte integer, byte 22 = MSB. Range: 0 to 9900 (dec).
		byte 24-25	Ammo type 2, two byte integer, byte 24 = MSB. Range: 0 to 9900 (dec).
		byte 26-27	Ammo type 3, two byte integer, byte 26 = MSB. Range: 0 to 9900 (dec).
28-29	XXXX	Checksum	Addition of bytes 1 through 27. byte 28 - Most significant byte. byte 29 - Least significant byte.

Name: Differential Data Request

Direction: VDD to DCI and
PDD to DCI

Description: The Detection Device requests differential data from DCI when it requires differential data for GPS.

Use: This message is used in decentralized mode when the Detection Device is unable to receive the differential data from the UHF link and in centralized mode during normal operation.

Format:

Byte #	Hex	Field	Description
1	BB	Sync	Identifies DCI/SAWE/MILES II communication.
2	31	Message ID	Identifies message type.
3	05	Size	Total message length in bytes.
4-5	00F1	Checksum	Addition of bytes 1 through 3. byte 4 - Most significant byte. byte 5 - Least significant byte.

Name: Ephemeris Data Request

Direction: VDD to DCI and
PDD to DCI

Description: The Detection Device requests ephemeris data from DCI when it requires ephemeris data for GPS. Ephemeris data enables GPS to perform a □fast fix□.

Use: This message is used in decentralized mode when the Detection Device is unable to receive the ephemeris data over the UHF link.

Format:

Byte #	Hex	Field	Description
1	BB	Sync	Identifies DCI/SAWE/MILES II communication.
2	30	Message ID	Identifies message type.
3	05	Size	Total message length in bytes.
4-5	00F0	Checksum	Addition of bytes 1 through 3. byte 4 - Most significant byte. byte 5 - Least significant byte.

Name: Event Reports

Direction: VDD to DCI and
PDD to DCI

Description: The Detection Device reports the recorded event when it occurs.

Use: The Detection Device reports events in both centralized and decentralized modes

Format:

Byte #	Hex	Field	Description
1	BB	Sync	Identifies DCI/SAWE/MILES II communication.
2	33	Message ID	Identifies message type.
3	15	Size	Total message length in bytes.
4-5	XXXX	Event Number	Index indicating the number of the event report. Unsigned integer. byte 4 - Most significant byte byte 5 - Least significant byte
6	XX	Event Code	Varies according to event report type. See Table A-2.
7	XX	Event Subcode	Varies according to event report type. See Table A-2.
8	XX	Zone of Impact	Varies according to event report type. See Table A-2.
9-12	XX...XX	*Position	bytes 9-10 - Local grid Northings. Unsigned integer LSB = 1 meter, range: 0 to 65534m. Low byte first. The value FFFF (hex) = 65535m is used to indicate out of range. bytes 11-12 - Local grid Eastings. Unsigned integer LSB = 1 meter, range: 0 to 65534m. Low byte first. The value FFFF (hex) = 65535m is used to indicate out of range.
13-14	XX...XX	Player ID	Varies according to event report type. See Table A-2.

* Position is not valid for all event report messages, however, it shall be valid for the following event Codes: 1,2,4,5,6,A,B,E,F,10-13,19,1A-1F,29,2D-3D.

Format (Event Report continued):

Byte #	Hex	Field	Description
15-18	XX	Time	Time in BCD. byte 15 - day of week/tenths. Least sig. nibble = tenths of second range: 0 to 9. Most sig. nibble = day of week. 1 - Sunday. 2 - Monday. 3 - Tuesday. 4 - Wednesday. 5 - Thursday. 6 - Friday. 7 - Saturday. byte 16 - hour in BCD, range: 0 to 23 (dec). byte 17 - minute in BCD, range: 0 to 59 (dec). byte 18 - second in BCD, range: 0 to 59 (dec).
19	XX	HUTT Position	for PDD - invalid, hex value = 00. for non-turreted VDD - invalid, hex value = 04. for turreted VDD - failed HUTT = 04. for turreted VDD - Hull to Turret Position, relative position in 45? increments, range: 00 to 07.
20-21	XXXX	Checksum	Addition of bytes 1 through 19. byte 20 - Most significant byte. byte 21 - Least significant byte.

Table A-2. Event Report - Variable Fields

Event Report Type	Event Code (Byte 6)	Event Subcode (Byte 7)	Zone of Impact (Byte 8)	Position (Bytes 9-12)	Player ID (Bytes 13-14)
Vehicle Init	00 (hex)	00 (hex)	00 (hex)	Invalid	0000 (hex)
Description: The VDD was initialized via a Set Vehicle Type message from a DCI, SLID, or CIS through the DCI.					
Resurrection	01 (hex)	00 (hex)	00 (hex)	XXXXXXXX	BBBB (hex)
Description: The DD was resurrected by the DCI. Rounds were not reset.					
Reset	02 (hex)	00 (hex)	00 (hex)	XXXXXXXX	BBBB (hex)
Description: The DD was reset by the DCI/SLID. Rounds were reset.					
Memory Dump to SLID	03 (hex)	00 (hex)	00 (hex)	Invalid	0000 (hex)
Description: The DD was requested to dump its memory to the serial link interface device.					
Optical Resurrection	04 (hex)	1E	00 (hex)	XXXXXXXX	0000 (hex)
Description: The DD was optical resurrected. Rounds were not reset.					
Cheat Kill	05 (hex)	00 (hex)	00 (hex)	XXXXXXXX	0000 (hex)
Description: The DD detected the user cheating. If the key is returned to the normal position a controller-key reset will be sent. Ten seconds after the cheat is detected the DD will kill itself.					
Controller Key Detect	06 (hex)	00 (hex) 01 (hex)	00 (hex)	XXXXXXXX	0000 (hex)
Description: The DD detected the use of a controller key. The DD has been resurrected, reset. VDD type may have been changed, or etc. Event subcode □00□ indicates key turned to controller position; Event subcode □01□ indicates key returned to the home position.					

Table A-2. Event Report - Variable Fields

Event Report Type	Event Code (Byte 6)	Event Subcode (Byte 7)	Zone of Impact (Byte 8)	Position (Bytes 9-12)	Player ID (Bytes 13-14)
Time/Sync Rollover	07 (hex)	Year in BCD range (decimal) - 0 to 99	00 (hex)	Invalid	byte 13 - month in BCD range (decimal): 1 (Jan) to 12 (Dec) byte 14 - day in BCD range (decimal): 1 to 31
Description: The DD received a time sync or the day changed.					
Power On	08 (hex)	00 (hex) - Alive 01 (hex) - Dead	00 (hex)	Invalid	0000 (hex)
Description: The DD was powered on. This message is sent in Uninstrumented Mode. The Event Subcode indicates Player Status after Power On.					
Power Off	09 (hex)	00 (hex) - Alive	00 (hex)	Invalid	0000 (hex)
Description: The DD was powered off.					
Weapon Fired (VDD only)	0A (hex)	MILES Weapon Code see Table A-3 for Vehicle Weapons data see Table A-8	00 (hex)	XXXXXXXX	**Enhanced MILES PID Code see Table A-7 byte 13 - 1st two PID digits byte 14 - 2nd two PID digits
Description: The indicated weapon was fired.					
Trigger Released (VDD only)	0B (hex)	MILES Weapon Code see Table A-3 for Vehicle Weapons data see Table A-8	00 (hex)	XXXXXXXX	**Enhanced MILES PID Code see Table A-7 byte 13 - 1st two PID digits byte 14 - 2nd two PID digits

_____** If the PID is not decoded properly or is missing (MILES I), a default of □0000□ is used.

Table A-2. Event Report - Variable Fields

Event Report Type	Event Code (Byte 6)	Event Subcode (Byte 7)	Zone of Impact (Byte 8)	Position (Bytes 9-12)	Player ID (Bytes 13-14)
Miss	0E (hex)	MILES Weapon Code see Table A-3	PDD - 00 (hex) VDD - bit 0 (ls) = zone 1 bit 1 = zone 2 bit 2 = zone 3 bit 3 = zone 4 bit 4-7 = 0	XXXXXXXX	**Enhanced MILES PID Code see Table A-7 byte 13 - 1st two PID digits byte 14 - 2nd two PID digits
Description: A miss by the indicated player was recorded in the DD.					
Hit (VDD only)	0F (hex)	MILES Weapon Code see Table A-3	bit 0 (ls) = zone 1 bit 1 = zone 2 bit 2 = zone 3 bit 3 = zone 4 bit 4-7 = 0	XXXXXXXX	**Enhanced MILES PID Code see Table A-7 byte 13 - 1st two PID digits byte 14 - 2nd two PID digits
Description: A hit by the indicated player was recorded in the VDD.					
Kill	10 (hex)	MILES Weapon Code see Table A-3	PDD - 00 (hex) VDD - bit 0 (ls) = zone 1 bit 1 = zone 2 bit 2 = zone 3 bit 3 = zone 4 bit 4-7 = 0	XXXXXXXX	**Enhanced MILES PID Code see Table A-7 byte 13 - 1st two PID digits byte 14 - 2nd two PID digits
Description: A kill by the indicated player was recorded in the DD. PDD's equipped with either Stinger or Javelin a kill code 200 is actually a firing event.					

** If the PID is not decoded properly or is missing (MILES I), a default of "0000" is used.

Table A-2. Event Report - Variable Fields

Event Report Type	Event Code (Byte 6)	Event Subcode (Byte 7)	Zone of Impact (Byte 8)	Position (Bytes 9-12)	Player ID (Bytes 13-14)
Mobility Kill	11 (hex)	MILES Weapon Code see Table A-3	bit 0 (ls) = zone 1 bit 1 = zone 2 bit 2 = zone 3 bit 3 = zone 4 bit 4-7 = 0	XXXXXXXX	**Enhanced MILES PID Code see Table A-7 byte 13 - 1st two PID digits byte 14 - 2nd two PID digits
Description: A mobility kill by the indicated player was recorded in the VDD.					
Firepower Kill	12 (hex)	MILES Weapon Code see Table A-3	bit 0 (ls) = zone 1 bit 1 = zone 2 bit 2 = zone 3 bit 3 = zone 4 bit 4-7 = 0	XXXXXXXX	**Enhanced MILES PID Code see Table A-7 byte 13 - 1st two PID digits byte 14 - 2nd two PID digits
Description: A firepower kill by the indicated player was recorded in the VDD.					
Communications Kill	13 (hex)	MILES Weapon Code see Table A-3	bit 0 (ls) = zone 1 bit 1 = zone 2 bit 2 = zone 3 bit 3 = zone 4 bit 4-7 = 0	XXXXXXXX	**Enhanced MILES PID Code see Table A-7 byte 13 - 1st two PID digits byte 14 - 2nd two PID digits
Description: A communications kill by the indicated player was recorded in the VDD.					

** If the PID is not decoded properly or is missing (MILES I), a default of □0000□ is used.

Table A-2. Event Report - Variable Fields

Event Report Type	Event Code (Byte 6)	Event Subcode (Byte 7)	Zone of Impact (Byte 8)	Position (Bytes 9-12)	Player ID (Bytes 13-14)
Low Battery Warning (MILES)	14 (hex)	00 (hex)	00 (hex)	Invalid	0000 (hex)
Description: The user was warned of a low battery.					
Weapon Key In	15 (hex)	00 (hex) or 01 (hex)	Invalid	Invalid	0000 (hex)
Description: A user inserted the weapon key in the DD. Event Subcode "00" indicates key turned to Weapon. Key position. Event Subcode "01" indicates key turned from Weapon Key position to Home position.					
SAWE Miss	19 (hex)	IF Weapon type see Table A-4	00 (hex)	XXXXXXXX	CIS initiated - BBBB (hex) Otherwise - 0000 (hex)
Description: A miss was assessed by SAWE (N/A to Nuclear weapon).					
SAWE Hit (VDD only)	1A (hex)	IF Weapon type see Table A-4	00 (hex)	XXXXXXXX	CIS initiated - BBBB (hex) Otherwise - 0000 (hex)
Description: A hit was assessed by SAWE (VDD only).					
SAWE Kill	1B (hex)	IF Weapon type see Table A-4	00 (hex)	XXXXXXXX	CIS initiated - BBBB (hex) Otherwise - 0000 (hex)
Description: A kill was assessed by SAWE.					
SAWE Mobility Kill (VDD only)	1C (hex)	IF Weapon type see Table A-4	00 (hex)	XXXXXXXX	CIS initiated - BBBB (hex) Otherwise - 0000 (hex)
Description: A mobility kill was assessed by SAWE.					

Table A-2. Event Report - Variable Fields

Event Report Type	Event Code (Byte 6)	Event Subcode (Byte 7)	Zone of Impact (Byte 8)	Position (Bytes 9-12)	Player ID (Bytes 13-14)	
SAWE Firepower Kill (VDD only)	1D (hex)	IF Weapon type see Table A-4	00 (hex)	XXXXXXXX	CIS initiated - BBBB (hex) Otherwise - 0000 (hex)	
Description: A firepower kill was assessed by SAWE.						
SAWE Communications Kill (VDD only)	1E (hex)	IF Weapon type see Table A-4	00 (hex)	XXXXXXXX	CIS initiated - BBBB (hex) Otherwise - 0000 (hex)	
Description: A communications kill was assessed by SAWE.						
SAWE Chem. Contamination (VDD only)		1F (hex) see Table A-4	IF Weapon type	00 (hex)	XXXXXXXX	0000 (hex)
Description: A chemical contamination was assessed by SAWE.						
SAWE Reset	20 (hex)	00 (hex)	00 (hex)	Invalid	0000 (hex)	
Description: SAWE reset the unit.						
BIT Failure	21 (hex)	SAWE BIT failures failures see Table A-5	(VDD) MILES II/ PU BIT failures see Table A-6 (PDD) = 00	Invalid	byte 13 = CIS/DCI initiated - BB otherwise - 00 (PDD) byte 14 = (see table A-6) (VDD) byte 14 = CIS/DCI initiated - BB otherwise - 00	
Description: BIT was performed in the DD and failure(s) were detected.						
SAWE Init	22 (hex)	00 (hex)	00 (hex)	Invalid	0000 (hex)	
Description: SAWE initialized the unit.						

Table A-2. Event Report - Variable Fields

Event Report Type	Event Code (Byte 6)	Event Subcode (Byte 7)	Zone of Impact (Byte 8)	Position (Bytes 9-12)	Player ID (Bytes 13-14)
*SAWE Sleep	23 (hex)	00 (hex)	00 (hex)	Invalid	0000 (hex)
Description: SAWE entered sleep mode.					
*SAWE Wake	24 (hex)	00 (hex)	00 (hex)	Invalid	0000 (hex)
Description: SAWE entered wake mode.					
Reference Corner	25 (hex)	00 (hex)	00 (hex)	Invalid	Invalid
Description: The DD received southwest reference corner data.					
SAWE Battery Low	26 (hex)	00 (hex)	00 (hex)	Invalid	0000 (hex)
Description: SAWE reported a low battery condition.					
PMI Battery Low (PDD only)	27 (hex)	00 (hex)	00 (hex)	Invalid	0000 (hex)
Description: The protective mask interface reported a low battery condition.					
Frequency Change	28 (hex)	00 (hex)	00 (hex)	Invalid	0000 (hex)
Description: The DD executed a frequency change command.					

* Not implemented by the JMRC CIS

Table A-2. Event Report - Variable Fields

Event Report Type	Event Code (Byte 6)	Event Subcode (Byte 7)	Zone of Impact (Byte 8)	Position (Bytes 9-12)	Player ID (Bytes 13-14)
Initialization	29 (hex)	00 (hex)	00 (hex)	XXXXXXXX	BBBB (hex)
Description: The DD was initialized by an Initialize Event Command.					
*CIS Sleep	2A (hex)	00 (hex)	00 (hex)	Invalid	BBBB (hex)
Description: The DD received a sleep command from the PU.					
*CIS Wake	2B (hex)	00 (hex)	00 (hex)	Invalid	BBBB (hex)
Description: The DD received a wake command from the PU.					
SAWE Shutdown	2C (hex)	00 (hex)	00 (hex)	Invalid	0000 (hex)
Description: SAWE was powered off.					
Chemical Contamination (VDD only)	2D (hex)	IF Weapon type see Table A-4	00 (hex)	XXXXXXXX	BBBB (hex)
Description: A chemical contamination command by the PU was recorded in the VDD.					
Normal SAWE RTCA Mode	2E (hex)	00 (hex)	00 (hex)	XXXXXXXX	BBBB (hex)
Description: The DD received a Normal SAWE RTCA Mode command from the DCI.					
No-Kill SAWE RTCA Mode	2F (hex)	00 (hex)	00 (hex)	XXXXXXXX	BBBB (hex)
Description: The DD received a No-Kill SAWE RTCA Mode command from the DCI.					

*Not implemented by the JMRC CIS.

Table A-2. Event Report - Variable Fields

Event Report Type	Event Code (Byte 6)	Event Subcode (Byte 7)	Zone of Impact (Byte 8)	Position (Bytes 9-12)	Player ID (Bytes 13-14)
Vehicle Power On (VDD only)	30 (hex)	00 (hex)	00 (hex)	XXXXXXXX	0000 (hex)
Description: Vehicle power was turned on at the time indicated.					
Vehicle Power Off (VDD only)	31 (hex)	00 (hex)	00 (hex)	XXXXXXXX	0000 (hex)
Description: Vehicle power was turned off at the time indicated.					
NBC System Off* (VDD only)	32 (hex)	00 (hex)	00 (hex)	XXXXXXXX	0000 (hex)
Description: The NBC system was shut off at the time indicated.					
Blower On* (VDD only)	33 (hex)	00 (hex)	00 (hex)	XXXXXXXX	0000 (hex)
Description: The NBC blower was turned on at the time indicated.					
Pressure On* (VDD only)	34 (hex)	00 (hex)	00 (hex)	XXXXXXXX	0000 (hex)
Description: The NBC pressure system was enabled at the time indicated.					
NBC Error* (VDD only)	35 (hex)	00 (hex)	00 (hex)	XXXXXXXX	0000 (hex)
Description: An NBC operator error was detected at the time indicated.					

_____*Reserved for future use, not currently implemented.

Table A-2. Event Report - Variable Fields

Event Report Type	Event Code (Byte 6)	Event Subcode (Byte 7)	Zone of Impact (Byte 8)	Position (Bytes 9-12)	Player ID (Bytes 13-14)
Mic A Operator Error* (VDD only)	36 (hex)	00 (hex)	00 (hex)	XXXXXXXX	0000 (hex)
Description: A microphone keying operator error was detected at the time indicated.					
Mic A On* (VDD only)	37 (hex)	00 (hex)	00 (hex)	XXXXXXXX	0000 (hex)
Description: The microphone was enabled at the time indicated.					
Mic A Off* (VDD only)	38 (hex)	00 (hex)	00 (hex)	XXXXXXXX	0000 (hex)
Description: The microphone was disabled at the time indicated.					
Mic A Sys Error* (VDD only)	39 (hex)	00 (hex)	00 (hex)	XXXXXXXX	0000 (hex)
Description: A microphone monitoring system error was detected at the time indicated.					
Mic B Operator Error* (VDD only)	3A (hex)	00 (hex)	00 (hex)	XXXXXXXX	0000 (hex)
Description: A microphone keying operator error was detected at the time indicated.					
Mic B On* (VDD only)	3B (hex)	00 (hex)	00 (hex)	XXXXXXXX	0000 (hex)
Description: The microphone was enabled at the time indicated.					

*Reserved for future use, not currently implemented.

Table A-2. Event Report - Variable Fields

Event Report Type	Event Code (Byte 6)	Event Subcode (Byte 7)	Zone of Impact (Byte 8)	Position (Bytes 9-12)	Player ID (Bytes 13-14)
Mic B Off* (VDD only)	3C (hex)	00 (hex)	00 (hex)	XXXXXXXX	0000 (hex)
Description:	The microphone was disabled at the time indicated.				
Mic B Sys Error* (VDD only)	3D (hex)	00 (hex)	00 (hex)	XXXXXXXX	0000 (hex)
Description:	A microphone monitoring system error was detected at the time indicated.				
Optical Reset	52 (hex)	00 (hex)	00 (hex)	XXXXXXXX	0000 (hex)

Description: The DD was optically reset. Rounds were reset to load set at initialization.

_____*Reserved for future use, not currently implemented.

Table A-3. MILES Weapon Code Definitions

Event Subcode (HEX)	MILES Weapon
00	Universal Kill (Controller Gun), Continuous 00 for weapon boresighting
01	Missile: Maverick (various Aircraft), AGES Hellfire, TWGSS TOW
02*	Missile: Hellfire (AH64, AH58)
03*	Missile: AT-3 Sagger (BMP1, BRDM-1, HIND-D, Man), [MILES I: AT-8 Songster (T-80)
04	Mortar: 60mm (Man), 81mm, 107mm (4.2 in.), 120mm, 160mm, 240mm (Various GV, Man)
05	Mine: M15 Track Cutter [MILES I: Gun AA: 23m (Radar Mode) (ASETIV)]
06	Weapon X
07*	Missile: TOW ATGW (M2, M3, AH6, AH64, AH1S, LAV-25, M113, M901, HMMWV, Man), Shillelagh (M551), AT4 Spigot (Man), [MILES I: AT-5 Spandrel ATGW (BMP2, BRDM, Hind-D)], AT6 Spiral ATGW (HIND-D)] AT-8 Songster (T-80), Predator TOW IIB
08*	Missile ATGW: M47 Dragon (Man), AT-5 Spandrel (BMP2, BMP2C, GRDM2, HIND-E) Rocket AT: RPG-16 (Man), NTC BRDM-2
09	Flame Thrower: M202 (Man), JAVELIN
0A	Mine: M21 AT (man) Main Gun: 125mm (T72, T80)
0B	Mine: M81A1 Claymore AP (Man), M16
0C	Main Gun: 105mm (M1, M60 variants)
0D	Howitzer: 152mm (M1973), 122mm (M1974), 155mm (M109), 100mm (M1944) Rocket: 122mm BM21 (truck)
0E	Rocket: 2.75in (AH-64, AH-1S), 57mm Rocket (HIND-D, HIND-E) Main Gun: 73mm (BMP1)
0F	Rocket: 66 mm M72 LAW (Man), 70mm Viper (Man), AT-4
10	Main Gun: 120mm (M1A1, M1A2 Tank)
11	Rifle (Recoilless): 90mm (Man)
12	Howitzer: 203mm (8-inch) (M110A2), 105mm (M102, M108), 122 mm, 155mm (M109A2, M198)
13	Grenade: 40mm Mark 19 AGS, 40mm M203 Grenade (HMMWV, Man)
14	Bomb, Cluster: Rockeye (Various Aircraft), SMAW
15	Gun: 30mm GAU-8 Avenger (Various Aircraft), AH-64
16	Gun, AA: 23mm (ZSU-23/4 or ASET IV in Visual Mode) Main Gun: 25mm (M2A2, M3A2, LAV-25)
17	Gun, AA: 20mm Vulcan (M163, M167, AH-1S) Main Gun: 30mm (BMP2, BMP2C, HIND-D)
18	Machine Gun .50 cal (12.7mm): M2, M85, etc. (Various GV, RW, Man)
19	Missile (SAM): Chaparral (M548, M730), SA-9 Gaskin (BRDM-2 Chassis), SA-13 Gopher (BRDM-2 Chassis), [MILES I: Stinger (AH-58, OH-58D)], ASET IV
1A	Missile (SAM): Stinger (AH-58, OH-58D, HMMWV, Man), [MILES I: SA-9 Gaskin (ASETIV RF/IR), SA-13 Gopher (ASETIV)]
1B*	Rifle: .22 cal (5.56mm) M16 Machine Gun .30 cal (7.62mm): M60, M240, Coax, etc. (Various GV, Man) Missile: Hellfire, AT-3 Sagger, TOW, Shillelagh, AT-5 Spandrel, AT-6 Spiral, AT-8 Songster, M47 Dragon (PPD kill codes are transmitted by these missiles after they transmit MILES codes 02, 03, 07, or 08. The PDD reports an Event Subcode 1B when killed by these missiles. All other DDs report Events subcodes 02, 03, 07, or 08 and do not report 1B.)
1C	Heavy Miss: 105mm, 152mm, 73mm, Viper (LAW) etc.
1D	Light Miss: Rifle, Machine Gun, 20mm, etc.
1E	Optical Resurrect (Controller Gun), Light spare miss, Reset for aircraft systems
1F	Heavy Spare Miss

Table A-3. MILES Weapon Code Definitions

Event Subcode (HEX)	MILES Weapon
20	IFS Actuation
21	Missile (SAM): SA-14 Gremlin (Man)
22	Gun AA: 23mm (ZSU-23/4 Radar Mode)
23	Controller gun/Utility code assessment
24	Optical Reset (Smart Controller Gun), Resurrect for aircraft systems

* PDD's killed by the missiles associated with Event Subcodes, 02, 03, 07, and 08 report Event Subcode 1B instead of codes 02, 03, 07, or 08. All other DDs report the Event Subcodes 02, 03, 07, or 08.

Table A-4. Indirect Fire Weapon Types

Event Subcode (Hex)	Weapon Type
Artillery/Mortar	
00	(reserved)
01	M720-PD, 60 mm HE
02	M821-PD, 81 mm HE
03	M1-PD, 105 mm HE
04	M1-VT, 105 mm HE
05	M444, 105 mm APICM
06	M107-PD, 155 mm HE
07	M107-VT, 155 mm HE
08	M4449A1, 155 mm APICM
09	M483A1, 155 mm DPICM
0A	M106-PD, 8 inch HE
0B	M106-VT, 8 inch HE
0C	M404, 8 inch APICM
0D	M509A1, 8 inch DPICM
0E	M26, MLRS DPICM
0F	MK49, 5 inch 38 HE
10	MK56, 5 inch AAC
11	MK61, 5 inch HE
12	MK41, 5 inch 54 AAC
13	MK25, 8 inch HE
14	MK13, 16 inch HE
15	MG76-PD, 76 mm HE
16	VO82-PD, 82 mm HE
17	OF843A-PD, 120 mm HE
18	OF843A-VT, 120 mm HE
19	OF24-PD, 122 mm HE
1A	OF24-VT, 122 mm HE
1B	F864-PD, 240 mm HE
1C	F864-VT, 240 mm HE
1D	OF482-PD, 130 mm HE
1E	OF482-VT, 130 mm HE
1F	OF25-PD, 152 mm HE
20	OF25-VT, 152 mm HE
21	XDP540, 152 mm DPICM
22	F620-PD, 203 mm HE
23	F620-VT, 203 mm HE
24	XDP620, 203 mm DIPCM
25	9M22YF-PD, 132 mm MRL HE
26	9M22KX, 122 mm MRL HE
27	9M27F-PD, 220 mm MRL DIPCM
28	9M27KX, 220 mm MRL DPICM
29	FROG-PD, 540 mm ROCKET
2A	CONV042
.	.
.	.
C8	CONV200
42	M329A1 PD, 107mm, HE Mortar (Blue)
43	M329A1 VT, 107mm, HE Mortar (Blue)
44	M933 PD, 120mm, HE Mortar (Blue)
45	F853 PD, 160mm, HE Mortar (Red)

Table A-4. Indirect Fire Weapon Types (continued)

Event Subcode (Hex)	Weapon Type
RF-Mine	
C9	MINE
CA	MINE-2
CB	MINE-3
CC	MINE-4
CD	MINE-5
Chemical	
CE	CHEMA1 (blister)
CF	CHEMB1 (nerve I)
D0	CHEMB2 (nerve U)
D1	CHEMC1 (blood I)
D2	CHEMC2 (blood U)
D3	CHEMD1 (choking I)
D4	CHEMD2 (choking U)
D5	CHEME1
D6	CHEME2
D7	CHEMF1
D8	CHEMF2
D9	CHEMG1
DA	CHEMG2
DB	CHEMH1
DC	CHEMH2
DD	CHEMI1
DE	CHEMI2
DF	CHEMJ1
E0	CHEMJ2
Nuclear	
E1	W10 Y-1
E2	W10 Y-2
E3	W15 Y-1
E4	W15 Y-2
E5	W20 Y-1
E6	W20 Y-2
E7	W30 Y-1
E8	W30 Y-2
E9	W30 Y-3
EA	W40 Y-1
EB	W40 Y-2
EC	W50 Y-1
ED	W50 Y-2
EE	W50 Y-3

Table A-4. Indirect Fire Weapon Types (continued)

Event Subcode (Hex)	Weapon Type
EF	NUC7
F0	NUC8
F1	NUC9
F2	NUC10
F3	EXP
MES	
F4	AT-MES
F5	AP-MES
F6-FE	(spares)
FF	Power On Kill

Table A-5. SAWE BIT failures

A □1□ in a bit position indicates the corresponding unit failed. Bit assignments are:

(MSB)	bit 7 - MCS Board.
	bit 6 - Radio Cable (VDD Only).
	bit 5 - GPS Antenna.
	bit 4 - GPS RF Unit.
	bit 3 - GPS Digital Board.
	bit 2 - MES Antenna.
	bit 1 - MCS Antenna.
(LSB)	bit 0 - SAWE Controller Board.

Table A-6. MILES II/DCI BIT Failures

A □1□ in a bit position indicates the corresponding unit failed. Bit assignments are:

(MSB)	bit 7 - not assigned.
	bit 6 - Detector Belts.
	bit 5 - Transceiver Module (DCI).
	bit 4 - Processor Module (DCI).
	bit 3 - HUTT XMTR (VDD).
	bit 2 - Memory Unit (MILES II).
	bit 1 - Decoding (SAWE/MILES II- VDD Only).
(LSB)	bit 0 - Encoding (SAWE/MILES II- VDD Only).

Table A-7. Enhanced MILES Player ID Codes

DD CONSOLE NUMBER	AMMO TYPE	BLUEFOR ENHANCED PID (Even Only)	OPFOR ENHNACED PID (Odd Only)
001..165	AMMO 0	0002 - 0330	0001 - 0329
166..330	.	1002 - 1330	1001 - 1329
331..495	.	2002 - 2330	2001 - 2329
496..660	.	3002 - 3330	3001 - 3329
001..165	AMMO 1	4002 - 4330	4001 - 4329
166..330	.	5002 - 5330	5001 - 5329
331..495	.	6002 - 6330	6001 - 6329
496..660	.	7002 - 7330	7001 - 7329
001..165	AMMO 2	8002 - 8330	8001 - 8329
166..330	.	9002 - 9330	9001 - 9329
331..495	.	A002 - A330	A001 - A329
496..660	.	B002 - B330	B001 - B329
001..165	AMMO 3	C002 - C330	C001 - C329
166..330	.	D002 - D330	D001 - D329
331..495	.	E002 - E330	E001 - E329
496..660	.	F002 - F330	F001 - F329

NOTES on Table A-7:

The Enhanced MILES PID is represented by 2 bytes (16 bits) as follows:

AMMO TYPE	bits 0..1	= 0..3 (decimal)	(Ammo types 1,2,3&4)
EXTENDED PID	bits 2..3	= 0..3 (decimal)	(most significant digit of PID)
BASIC PID	bits 4..15	= 1..330 (BCD)	(3 least significant digits of PID)

NOTES on Table A-7, Continued:

The PID is obtained by masking the AMMO TYPE and then concatenating the EXTENDED PID to the BASIC PID. An example would be: EXTENDED PID = 1, BASIC PID = 234, the PID would be 1234. The BASIC PID ranges from 1 to 330 therefore the concatenation of the two results in gaps in the PID□s as follows:

EXTENDED PID 0 + BASIC PID (1..330) = 0001..0330,
EXTENDED PID 1 + BASIC PID (1..330) = 1001..1330,
EXTENDED PID 2 + BASIC PID (1..330) = 2001..2330,
EXTENDED PID 3 + BASIC PID (1..330) = 3001..3330.

CONSOLE NUMBER: The console number of a DD in combination with the setting of the vehicle type (OPFOR or BLUEFOR vehicle) is what determines the PID for a DD. The consoles are numbered sequentially, however as shown above, the PID□s are not sequential. The following shows PID assignments for various consoles.

CONSOLE 1	OPFOR VEH = PID 1	BLUEFOR VEH = PID 2
CONSOLE 2	OPFOR VEH = PID 3	BLUEFOR VEH = PID 4
CONSOLE 3	OPFOR VEH = PID 5	BLUEFOR VEH = PID 6
.	.	.
CONSOLE 165	OPFOR VEH = PID 329	BLUEFOR VEH = PID 330
CONSOLE 166	OPFOR VEH = PID 1001	BLUEFOR VEH = PID 1002
.	.	.
CONSOLE 330	OPFOR VEH = PID 1329	BLUEFOR VEH = PID 1330
CONSOLE 331	OPFOR VEH = PID 2001	BLUEFOR VEH = PID 2002
.	.	.
CONSOLE 495	OPFOR VEH = PID 2329	BLUEFOR VEH = PID 2330
CONSOLE 496	OPFOR VEH = PID 3001	BLUEFOR VEH = PID 3002
.	.	.
CONSOLE 660	OPFOR VEH = PID 3329	BLUEFOR VEH = PID 3330

For small arms, automatic type weapons (codes 27 and 29) the ammo type is used to indicate the type of the firing player as follows:

Platform Mounted Weapons	Ammo Type 0
Crew Served Weapons	Ammo Type 1
*Rifles	Ammo Type 2
*Rifles	Ammo Type 3

The maximum number of vehicles available before a PID is duplicated is 660 per vehicle type/platform. Within each console are two PIDs, one BLUEFOR and one OPFOR, for a total of 1320 unique PIDs. The PIDs associated with the BLUEFOR consoles are even integers and with the OPFOR consoles are odd integers.

The maximum number of PDD's available before a PID is duplicated is 5280.

* These configurations are not currently available with PID.

Table A-8. Vehicle Weapons Data

VDD Type (HEX)	Vehicle Type	*VDD Host Type	Actual Vehicle	Weapon	Type Number	MILES Code (HEX)	Basic Load	APDS	Heat	Init Load	Reload Time (sec.)	Reload Qty.	Weapon Track Time (sec.)	Fired Trigger Rel.
0	M1A2	M1/M60	M1	Main Gun	120mm	10	40	39	16	1	5	1		WF
				Coax	7.62	1B	9900	---	---	9900	0	0		WFTR
1	M1-120	M1/M60	M1	Main Gun	120mm	10	40	28	12	1	5	1		WF
				Coax	7.62	1B	9900	---	---	9900	0	0		WFTR
2	M1A1	M1/M60	---	Main Gun	105mm	0C	63	44	19	1	5	1		WF
				Coax	7.62	1B	1800	---	---	1800	0	0		WFTR
3	BMP2C	M2/M3	M113	Main Gun	30mm	17	500	100	---	70	10	50		WFTR
								---	400	70	10	50		
				Missile	Spandrel	07	5	---	---	1	15	1	Note 1	WFTR
				Coax	7.62	1B	2000	---	---	2000	0	0		WFTR
4	M2A2	M2/M3	M2	Main Gun	22mm	16	900	210	---	210AP	15	50		WFTR
								---	690	300HE	15	50		
				Missile	TOW	07	7	---	---	2	1	1	Note 1	WFTR
				Coax	7.62	1B	2400	---	---	2400	0	0		WFTR
5	M3A2	M2/M3	M3	Main Gun	25mm	16	1500	350	---	300AP	15	50		WFTR
								---	1150	300HE	15	50		
				Missile	TOW	07	12	---	---	2	1	1	Note 1	WFTR
				Coax	7.62	1B	4500	---	---	4500	0	0		WFTR
6	T80	M551	M60	Main Gun	125mm	0A	35	25	10	1	3	1		WF
				Missile	Songster	07	5	---	---	1	3	1	Note 1	WFTR
				Coax	7.62	1B	3000	---	---	3000	0	0		WFTR
7	T72	M551	---	Main Gun	125mm	0A	40	28	12	1	5	1		WF
				Coax	7.62	1B	3000	---	---	3000	0	0		WFTR
8	M1974	M551	M113	Main Gun	122mm	0D	40	0	40	1	8.5	1		WF
9	ZSU	M551	M113	Main Gun	23mm	16	2000	0	2000	500	10	40		WFTR

Table A-8. Vehicle Weapons Data (Continued)

VDD Type (HEX)	Vehicle Type	*VDD Host Type	Actual Vehicle	Weapon	Type Number	MILES Code (HEX)	Basic Load	APDS	Heat	Init Load	Reload Time (sec.)	Reload Qty.	Track Time (sec.)	Weapon Fired Trigger Rel.
A	BMPI	M551	---	Main Gun	73mm	0E	40	10	30	1	7.5	1		WF
				Missile	Sagger	03	5	---	---	1	12	1	Note 1	WFTR
				Coax	7.62	1B	1800	---	---	1800	0	0		WFTR
B	BMPII	M551	---	Main Gun	30mm	17	500	100	---	100AP	18	50		WFTR
								---	400	100HE	10	50		
				Missile	Spandrel	07	5	---	---	1	15	1	Note 1	WFTR
				Coax	7.62	1B	2000	---	---	2000	0	0		WFTR
C	BRDM	M551	HMMWV	Missile	Spandrel	08	15	---	---	1	15	1	Note 1	WFTR
D	M113	---	M113	---										
E	HMMWV	---	HMMWV	---										
F	M901	---	M901	---										

WF	=	Weapon Fired Event Report only expected
WFTR	=	Weapon Fired Event Report and Trigger Released Event Report expected
*	=	VDD Host Vehicle pertains only to the VDD and must match the actual vehicle wired for trigger pulls
AP	=	APDS
HE	=	Heat

Note 1- Message BB 02 Byte 4 is formatted as follows for :

Time of Flight (X)	**Vehicle Type (Y)**
0 - Weapon default	3 = BMPC (Default 6 seconds)
1 - 3.5 second TOF	4 = M2A2 (Default 12 seconds)
4 - 5.0 second TOF	5 = M3A2 (Default 12 seconds)
6 - 6.0 second TOF	6 = T80 (Default 10 seconds)
8 - 7.0 second TOF	A = BMP I (Default 10 seconds)
A - 8.5 second TOF	B = BMP II (Default 6 seconds)
E - 12.5 second TOF	C = BRDM (Default 10 seconds)

Table A-8a Air Defense Plus Vehicle Weapons Data

VDD Type (HEX)	Vehicle Type	*VDD Host Type	Actual Vehicle	Weapon	Type Number	MILES Code (HEX)	Basic Load	APDS	Heat	Init Load	Reload Time (sec.)	Reload Qty.	Weapon Track Time (sec.)	Fired Trigger Rel.
0	C3	M1/M60	M1	None										
1	IR-SAM			Missile	IRM	19	4			1	120	1		WF
2	RF-SAM			Missile	RFM	19	4			1	120	1		WF
3	ASETBS			Missile	ABST	1C	99			99	1	99		WF
4	Avenger			Missile	STGR	1A	8			8	1	99		WF
				Coax	50	18	200			200	0	0		WFTR
5	Bradley	M2/M3	M3	Main Gun	25mm	16	900	210		210	15	50		WFTR
	Stinger									690	300	15	50	
				Missile	STGR	1A	4			4	60	1		WF
				Coax	7.62	1B	2400			2400	0	0		WFTR
6	**RESERVED**													
7	RESERVED													
8	RESERVED													
9	AAA			Main Gun	AAA	16	1100			1100	60	100		WFTR
A	**RESERVED**													
B	RESERVED													
C	RESERVED													
D	M113			None										
E	HMMWV			None										
F	**RESERVED**													

Name: *Initial Position, Time and Date Request

Direction: VDD to DCI and
PDD to DCI

Description: The Detection Device requests initial position, time and date data from the DCI for GPS.

Use: This message is used in decentralized mode when the Detection Device is unable to receive the initial position, time, and date data from the UHF link.

Format:

Byte #	Hex	Field	Description
1	BB	Sync	Identifies DCI/SAWE/MILES II communication.
2	32	Message ID	Identifies message type.
3	05	Size	Total message length in bytes.
4-5	00F2	Checksum	Addition of bytes 1 through 3. byte 4 - Most significant byte. byte 5 - Least significant byte.

* Not implemented by the JMRC DD.

Name: Missed Events Report

Direction: VDD to DCI and
PDD to DCI

Description: The Detection Device sends all of the events indexed by the "Request Missed Events" message in the format defined for the "Event Report" (Message ID = 33 hex). The data blocks (16 bytes each) of up to fifteen event reports that were missed by the DCI are grouped into the data block of this message.

Use: The Detection Device sends missed event reports in both centralized and decentralized modes.

Format:

Byte #	Hex	Field	Description
1	BB	Sync	Identifies DCI/SAWE/MILES II communication.
2	2C	Message ID	Identifies message type.
3	XX	Size	Total message length in bytes. Variable.
4 to 16(M-N)+19	XX	Data	Data bytes 4 through 19 of event report number N through event report number M.
16(M-N)+20 to 16(M-N)+21	XXXX	Checksum	Addition of bytes 1 through 16(M-N)+19. byte 16(M-N)+20 - Most significant byte. byte 16(M-N)+21) - Least significant byte.

Name: Position Report

Direction: VDD to DCI and
PDD to DCI

Description: The GPS position data is reported to the DCI. Bytes 4-14 shown below correspond directly to data bytes 3-13 of the "FILTERED NAV RESULTS LOCAL GRID FORMAT" message (ID = D7 hex) provided by the MX 7200 GPS Receiver. The Detection Device obtains position from GPS and sends it to the DCI at a regular interval. The data field of the "Unit Configuration Request" message defines the interval in seconds between position updates.

Use: This message is used during normal operation in both centralized and decentralized modes.

Format:

Byte #	Hex	Field	Description
1	BB	Sync	Identifies DCI/SAWE/MILES II communication.
2	2E	Message ID	Identifies message type.
3	10	Size	Total message length in bytes.
4-7	XX...XX	Time of Fix	UTC time of fix given as time of day. byte 4 - hour LSB = 1 hour, range: 0-17 (hex), 0 to 23 (dec) byte 5 - minutes LSB = 1 min. range: 0-38 (hex), 0 to 59 (dec) byte 6,7 - seconds LSB = 2^{-10} sec = 0.0009765625 sec range: 0 to EFFF (hex) = 59.999023 sec. Low byte first.
8-9	XXXX	Northings	Local grid Northings. Unsigned integer LSB = 1 meter, range: 0 to 65534m. Low byte first. The value FFFF (hex) = 65535m is used to indicate out of range.
10-11	XXXX	Eastings	Local grid Eastings. Unsigned integer LSB = 1 meter, range: 0 to 65534m. Low byte first. The value FFFF (hex) = 65535m is used to indicate out of range.
12-13	XXXX	Altitude	Signed integer LSB = 1 meter. Low byte first.

Format:

14	XX	Type of Fix	Hex values are: 01 - 2D non-differential 02 - 2D differential 03 - 3D non-differential 04 - 3D differential 05-09, A0, A1, F1 through FF - Failed to compute a fix. Number or quality of available satellite measurements is insufficient to compute the type of fix requested. See Table A-9 for definition of fix/nav failure codes.
15-16	XXXX	Checksum	Addition of bytes 1 through 14. byte 15 - Most significant byte. byte 16 - Least significant byte.

Table A-9. FIX/NAV Failure Codes

Hex Code	Reason for Failure
01	2D, non-differential
02	2D, differential
03	3D, non-differential
04	3D, differential
05	2D, PPS corrected
06	3D, PPS corrected
07	Position known
08	External DR
09	Coast
A0	GPS time-out (Previous Fix Being Used)
A1	New Fix Not Required (Previous Fix Being Used)
F1	Not enough valid satellite measurements
F2	Dilution of precision too large
F3	Standard deviation of filtered navigation too large
F4	Standard deviation of position fix too large
F5	Too many iterations in position fix
F6	Too many iterations in velocity fix
F7	3 satellite startup failed
F8	3 satellite fix update distance check failed
F9	Solved frequency was too large
FA	Solved velocity was larger than 900 mps
FB	Waiting for 2 consistent sets of measurements for velocity fix
FC	Computed altitude has violated export restriction
FD	Computed velocity has violated export restriction
FE	System mode is not a navigation mode
FF	Nav has not run since powerup

Name: Unit Configuration Report

Direction: VDD to DCI and
PDD to DCI

Description: The Detection Device reports its unit's configuration in response to a "Unit Configuration Request" from the DCI. The first data byte denotes a PDD or VDD and VDD type as applicable. The second data byte contains the DD Player ID.

Use: The message is used at initialization in both centralized and decentralized modes.

Format:

Byte #	Hex	Field	Description
1	BB	Sync	Identifies DCI/SAWE/MILES II communication.
2	28	Message ID	Identifies message type.
3	08	Size	Total message length in bytes.
4	XX	Unit conf-oration	Hex values are: Least significant nibble 0 - PDD 1 - VDD 2 - Aircraft 3 - Air Defense Plus VDD (use a "1" in this position until the CTC-IS has been modified Most significant nibble 0 through F - VDD type; see Table A-8. Aircraft - 0 through F; see Table C-8. Air Defense Plus - 0 through F; see Table A-8.
5-6	XXXX	Player ID	Byte 5 - Leading two digits of the DD player ID. Byte 6 - Trailing two digits of the DD player ID; see Table A-7.
7-8	XXXX	Checksum	Addition of types 1 through 6. byte 7 - Most significant byte. byte 8 - Least significant byte.

Name: UTC Date and Time Report

Direction: VDD to DCI and
PDD to DCI

Description: The GPS UTC date and time data is reported to the DCI. Bytes 4-14 shown below correspond directly to data bytes 3-13 of the "UTC DATE AND TIME" message (ID = D1 hex) provided by the MX 7200 GPS Receiver. The Detection Device begins sending the UTC date and time data from the GPS once every second after it has received a "UTC Time Start" message from the DCI. The Detection Device stops sending the UTC date and time data after it has received a "UTC Time Stop" message from the DCI. The Detection Device provides the UTC date and time data to the DCI within 0.5 sec of reading it from GPS.

Use: This message is used at initialization and may be used during normal operation in both centralized and decentralized modes.

Format:

Byte #	Hex	Field	Description
1	BB	Sync	Identifies DCI/SAWE/MILES II communication.
2	3E	Message ID	Identifies message type.
3	10	Size	Total message length in bytes.
4	XX	Year	Year since 1980. 8 bit unsigned integer.
5	XX	Month	8 bit unsigned integer. Range: 01 to 0C (hex), 1 (January) to 12 (December) (dec).
6	XX	Day	8 bit unsigned integer. Range: 01 to 1F (hex), 1 to 31 (dec).
7	XX	Hour	8 bit unsigned integer. Range: 00 to 17 (hex), 0 to 23 (dec).
8	XX	Minutes	8 bit unsigned integer. Range: 00 to 3B (hex), 0 to 59 (dec).
9	XX	Seconds	8 bit unsigned integer. Range: 00 to 3B (hex), 0 to 59 (dec).
10-13	XX...XX	Fraction of second	32 bit unsigned integer scaled LSB = 2^{-32} seconds.

Format (UTC Date and Time - Continued)

14	XX	Data	Type of information available. Hex values: 01 - Approximate time taken from battery backed up clock on MX 7200 digital PCB. 02 - Accurate time obtained during GPS satellite navigation. NOTE: Other Hex values (00, 03 to FF) which are undefined may be returned. Messages containing these values should not be used.
15-16	XXXX	Checksum	Addition of bytes 1 through 14. byte 15 - Most significant byte. byte 16 - Least significant byte.

Name: Velocity Report

Direction: VDD to DCI and
PDD to DCI

Description: The GPS velocity data is reported to the DCI. Bytes 4-11 shown below correspond directly to data bytes 3-10 of the □FILTERED NAV VELOCITY□ message (ID = D9 hex) provided by the MX 7200 GPS Receiver. The Detection Device obtains velocity from GPS and sends it to the DCI at a regular interval. The data field of the a Unit Configuration Request message defines the interval in seconds between position/velocity updates. This message immediately follows the a Position message from the Detection Device.

Use: This message is used during normal operation in both centralized and decentralized modes.

Format:

Byte #	Hex	Field	Description
1	BB	Sync	Identifies DCI/SAWE/MILES II communication.
2	2D	Message ID	Identifies message type.
3	0D	Size	Total message length in bytes.
4-5	XXXX	Velocity North	Scaled LSB= 2^{-5} meters/second. Low byte first. Ones compliment
6-7	XXXX	Velocity East	Scaled LSB=2^{-5} meters/second. Low byte first. Ones compliment
8-9	XXXX	Velocity Up	Scaled LSB=2^{-5} meters/second. Low byte first. Ones compliment
10-11	XXXX	Frequency offset	Scaled LSB=2^{-5} meters/second. Low byte first. Ones compliment
12-13	XXXX	Checksum	Addition of bytes 1 through 11. byte 12 - Most significant byte. byte 13 - Least significant byte.

APPENDIX B

Data Communications Interface to SAWE/SAWE/MILES II Detection Device Message Descriptions

Contents

Tables

Name: Almanac Data

Direction: DCI to VDD and
DCI to PDD

Description: The DCI sends page 135 of almanac data to the DD. The DD responds with an Acknowledge message. Within the Detection Device, SAWE/MILES II receives this message and passes the almanac data on to SAWE. SAWE provides the almanac data to GPS. Bytes 4-28 shown below correspond directly to data bytes 3-27 of the □SET ONE PAGE OF ALMANAC□ message (ID=0E hex) used by the MX7200 GPS Receiver.

Use: This message is in response to an □Almanac Data Request message from the DD (not currently implemented in the JMRC DD). In centralized mode it is sent automatically at initialization and then once every 24 hours.

Format:

Byte #	Hex	Field	Description
1	BB	Sync	Identifies DCI/SAWE/MILES II communication.
2	2F	Message ID	Identifies message type.
3	1E	Size	Total message length in bytes.
4	87	Almanac Page #	Page # indicating the type of Almanac data in bytes 5-28 below.
5-28	XX...XX	Almanac data	Page 135 (dec.) of Almanac data which includes ionosphere and UTC Parameters. Twenty four bytes packed in GPS-ICD-200 with parity bits, HOW and TLM words removed.
29-30	XXXX	Checksum	Addition of bytes 1 through 28. byte 29 - Most significant byte. byte 30 - Least significant byte.

Name: Ammo Level Request

Direction: DCI to VDD

Description: The DCI requests the ammo level from the DD. The DD responds with an Ammo Level message.

Use: This message is used in both centralized and decentralized modes.

Format:

Byte #	Hex	Field	Description
1	BB	Sync	Identifies DCI/SAWE/MILES II communication.
2	49	Message ID	Identifies message type.
3	05	Size	Total message length in bytes.
4-5	0109	Checksum	Addition of bytes 1 through 3. byte 4 - Most significant byte. byte 5 - Least significant byte.

Name: Ammo Level Set

Direction: DCI to VDD

Description: The DCI sends this command to the VDD to set its ammunition level. The VDD responds with an acknowledge.

Use: This message is used during initialization and normal operation in both centralized and decentralized modes.

Format:

Byte #	Hex	Field	Description
1	BB	Sync	Identifies DCI/SAWE/MILES II communication.
2	4A	Message ID	Identifies message type.
3	1E	Size	Total message length in bytes.
4	XX	Vehicle Type	Hex values are: 00 through 0F (hex); see table A-8.
5-12	XX	Main Gun	Main gun ammunition levels. The total of the levels for ammo types 0 through 3 must be less than or equal to 9900. byte 5-6 Ammo type 0 - APDS (default), two byte integer, byte 5 = MSB. Range: 0 to 9900 (dec). byte 7-8 Ammo type 1 - HEAT, two byte integer, byte 7 = MSB. Range: 0 to 9900 (dec). byte 9-10 Ammo type 2 - unused, two byte integer, byte 9 = MSB. Range: 0 to 9900 (dec). byte 11-12 Ammo type 3 - unused, two byte integer, byte 11 = MSB. Range: 0 to 9900 (dec).
13-20	XX	Missile	Missile ammunition levels. The total of the levels for ammo types 0 through 3 must be less than or equal to 99. byte 13-14 Ammo type 0, two byte integer, byte 13 = MSB. Range: 0 to 99 (dec). byte 15-16 Ammo type 1, two byte integer, byte 15 = MSB. Range: 0 to 99 (dec). byte 17-18 Ammo type 2, two byte integer, byte 17 = MSB. Range: 0 to 99 (dec). byte 19-20 Ammo type 3, two byte integer, byte 19 = MSB. Range: 0 to 99 (dec).

Format (Ammo Level Set - Continued)

Byte #	Hex	Field	Description
21-28	XX	Coax	Coax ammunition levels. The total of the levels for ammo types 0 through 3 must be less than or equal to 9900. byte 21-22 Ammo type 0, two byte integer, byte 21 = MSB. Range: 0 to 9900 (dec). byte 23-24 Ammo type 1, two byte integer, byte 23 = MSB. Range: 0 to 9900 (dec). byte 25-26 Ammo type 2, two byte integer, byte 25 = MSB. Range: 0 to 9900 (dec). byte 27-28 Ammo type 3, two byte integer, byte 27 = MSB. Range: 0 to 9900 (dec).
29-30	XXXX	Checksum	Addition of bytes 1 through 28. byte 29 - Most significant byte. byte 30 - Least significant byte.

Name: DCI Event Commands

Direction: DCI to VDD and
DCI to PDD

Description: A DCI Event Command is sent to the Detection Device. The Detection Device responds to the command by sending an Acknowledge message to the DCI. DCI Event Commands are initiated by the DCI, or other external means, and forwarded through the DCI to the DD. The Detection Device also stores the event and report it to the DCI.

Use: These messages are used in both centralized and decentralized modes.

Format:

Byte #	Hex	Field	Description
1	BB	Sync	Identifies DCI/SAWE/MILES II communication.
2	33	Message ID	Identifies message type.
3	07	Size	Total message length in bytes.
4	XX	Event Code	Identifies DCI Event Command type. See Table B?1 for descriptions. Hex values are: 00 - Initialize 01 - BIT 02 - Reset 03 - Resurrect 04 - Miss 05 - Hit 06 - Kill 07 - Mobility Kill (for VDD only) 08 - Firepower Kill (for VDD only) 09 - Communications Kill (for VDD only) *0A - Wake *0B - Sleep 0C - Chemical Contamination (for VDD only) 0D - Normal SAWE RTCA Mode (for decentralized mode only) 0E - No-Kill SAWE RTCA Mode (for decentralized mode only)

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* Not implemented by JMRC CIS

Format (DCI Event Commands continued):

Byte #	Hex	Field	Description

5	XX	Event Subcode	Varies according to DCI event command type.	
			Event Code	Event Subcode
			00,02,03,0A,0B, 0D,0E	00 (hex).
			01 (BIT)	A □1□ in a bit position indicates the corresponding module failed. Bit assignments are: bit 0 (LSB) - processor module. bit 1 - transceiver module. bits 2 to 7 - not assigned.
			04-09,0C	Indirect Fire Weapon type. See Table A-4.
6-7	XXXX	Checksum	Addition of bytes 1 through 5. byte 6 - Most significant byte. byte 7 - Least significant byte.	

Table B-1. CIS Event Command Descriptions

Command Type	Description
Initialize	The DCI commands the Detection Device to initialize. The Vehicle Detection Device is given a full ammunition count, (e.g., to the ammunition levels defined by the most recent Ammo Level Set command) is made alive if dead, its event memory is cleared, a nuclear sickness level is determined, and BIT is not executed as a result of this command. An initialization event is reported to the DCI.
BIT	The DCI commands the Detection Device to perform BIT. The single data byte contains the results of the DCI self-test. The results of the Detection Device BIT are displayed at the Detection Device together with the DCI BIT results. A □BIT Failure Event Report is sent to the DCI only if there was a failure detected.
Reset	The DCI commands the Detection Device to reset. The Detection Device is given a full ammunition count and is made alive if dead. No new nuclear sickness level is determined, event memory is not cleared, and BIT is not executed as a result of this command. A reset event is reported to the DCI.
Resurrect	The DCI commands the Detection Device to resurrect. The Detection Device is made alive again, if dead. The ammunition count is not changed, no new nuclear sickness level is determined, event memory is not cleared, and a BIT is not executed as a result of this command. The Detection Device reports a resurrect by SLID event to the DCI.
Miss	The DCI causes execution of standard miss actions in the Detection Device. The Detection Device records a miss event and reports it to the DCI.
Hit	The DCI causes execution of standard hit actions in the Detection Device. The Detection Device records a hit event and reports it to the DCI.
Kill	The DCI causes execution of standard kill actions in the Detection Device. The Detection Device records a kill event and reports it to the DCI.
Mobility Kill	The DCI causes execution of standard mobility kill actions in the VDD. The VDD records a mobility kill event and reports it to the DCI.
Firepower Kill	The DCI causes execution of standard firepower kill actions in the VDD. The VDD records a firepower kill event and reports it to the DCI. (NOTE that the terminology for Kill is equivalent to a Catastrophic Kill for a VDD which is equivalent to the Kill for a PDD.)
Communications Kill	The DCI causes execution of standard communications kill actions in the VDD. The VDD records a communications kill event and reports it to the DCI.

Wake	*The DCI commands the DD to wake and return to normal operation with its UHF and GPS receivers on. This message is sent after a sleep command. In response, the DD reports a CIS Wake event to the DCI.
Sleep	*The DCI commands the DD to enter sleep mode. During sleep mode the DD turns off its UHF and GPS receivers for predetermined periods of time to conserve power. In response, the DD reports a CIS Sleep event to the DCI.
Chemical Contamination	The DCI causes execution of standard chemical contamination actions in the VDD. The VDD records a chemical contamination event and reports it to the DCI.
Normal SAWE RTCA Mode	The DCI commands the Detection Device to use its normal SAWE RTCA.
No-Kill SAWE RTCA Mode	The DCI commands the Detection Device to use its No-Kill SAWE RTCA. Table B-2 shows how the SAWE RTCA results are modified in this mode.

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* Not implemented by JMRC CIS.

Table B-2. No-Kill SAWE RTCA Mode

	Original SAWE Casualty Assessment by DD:	Reduced Actual Result:
Conventional Munitions		
VDD:	Catastrophic Kill	--> Near Miss
	Firepower Kill	--> not affected
	Mobility Kill	--> not affected
	Commo Kill	--> not affected
PDD:	Kill	--> Near Miss
Chemical Munitions		
	This event is not recorded and no action is taken	
RF Mines		
VDD:	Catastrophic Kill	--> Mobility Kill
PDD:	Kill	--> Near Miss
MES		
VDD:	Catastrophic Kill	--> Mobility Kill
PDD:	Kill	--> Near Miss
Nuclear		
VDD:	Catastrophic Kill	--> Commo Kill
PDD:	Kill	--> Near Miss
	(Nuclear sickness level is not modified)	

Note: A combination of a firepower kill and a mobility kill results in a catastrophic kill.

Name: Differential Data

Direction: DCI to VDD and
DCI to PDD

Description: This data is reported to GPS in the DD to set the differential pseudo range corrections. The DD responds by sending an Acknowledge message to the DCI. Bytes 4 to N+6 shown below correspond directly to data bytes 3 through LEN-1, where LEN = 5*N1+5*N2+6, of the □SET DIFFERENTIAL PSEUDORANGE CORRECTIONS□ message (ID = 0F hex) required by the MX7200 GPS Receiver. Within the Detection Device, SAWE/MILES II receives this message and passes the differential data on to SAWE. SAWE provides the differential data to GPS.

Use: This message is an immediate response to a □Differential Data Request message from the Detection Device.

Format:

Byte #	Hex	Field	Description
1	BB	Sync	Identifies DCI/SAWE/MILES II communication.
2	31	Message ID	Identifies message type.
3	N+8 (in hex)	Size	Total message length in bytes.
4	XX	Data	4 MSS = N1 = number of type 1 RTCM corrections. 4 Labs = N2 = number of type 2 RTCM corrections. (Total number of data bytes = N = 5*N1 + 5*N2).
5-6	XXXX	Data	Reference time for RTCM corrections given as seconds in the hour, GPS time, LSB = 1.0 seconds. Low byte first.
7 to N1*5+6	XX	Data	Type 1 RTCM in accordance with RTCM 134-89/ SC 104-68) corrections for up to 15 satellites. Each satellite correction packet requires 5 bytes and includes the correction, correction rate, issue of ephemeris identifier, scale and UDRE bits.

Format (Differential Data continued):

N1*5+7 to N+6	XX	Data	Type 2 RTCM corrections for up to 15 satellites. Each satellite correction packet requires 5 bytes and includes the correction, correction rate, issue of ephemeris identifier, scale and UDRE bits.
N+7 to N+8	XXXX	Checksum	Addition of bytes 1 through N+6. byte N+7 - Most significant byte. byte N+8 - Least significant byte.

Name: Ephemeris Data

Direction: DCI to VDD and
DCI to PDD

Description: This message, or series of messages, contain detailed characteristics on the orbit of the satellites in view from the training area at a particular time. This data is reported to GPS in the DD to set the satellite ephemeris data in order to perform □fast fixes. Bytes 4-76 shown below correspond directly to data bytes 3-75 of the □SET SATELLITE EPHEMERIS□ message (ID = 0D hex) required by the MX7200 GPS Receiver. Within the Detection Device, SAWE/MILES II receives this message and passes the ephemeris data on to SAWE. SAWE provides the ephemeris data to GPS.

Use: This message is in response to an □Ephemeris Data Request message from the DD.

Format:

Byte #	Hex	Field	Description
1	BB	Sync	Identifies DCI/SAWE/MILES II communication.
2	30	Message ID	Identifies message type.
3	4E	Size	Total message length in bytes.
4	XX	Data	Satellite PRN.
5-28	XX...XX	Data	Packed subframe 1 data (given in ICD-GPS-200 format with parity bits, HOW and TLM words removed).
29-52	XX...XX	Data	Packed subframe 2 data (given in ICD-GPS-200 format with parity bits, HOW and TLM words removed).
53-76	XX...XX	Data	Packed subframe 3 data (given in ICD-GPS-200 format with parity bits, HOW and TLM words removed).
77-78	XXXX	Checksum	Addition of bytes 1 through 76. byte 77 - Most significant byte. byte 78 - Least significant byte.

Name: Set Initial Position, Time and Date

Direction: DCI to VDD and
DCI to PDD

Description: The purpose of this message is to re-initialize GPS with an approximate position, time and date so that the initial satellite acquisition can be performed without resorting to search-the-sky. SAWE uses the initial position in this message to set the center of the training area for GPS position known mode (NOTE: this mode is not currently implemented in the GPS navigator receiver, initial position data is reserved for future use). SAWE uses the UTM data to set the local grid origin (southwest reference corner). The DD responds by sending an acknowledge message to the DCI. Bytes 4-11, 22, 23, and 25-29 shown below correspond respectively to data bytes 3-17 of the □SET INITIAL POSITION, TIME AND DATE□ message (ID = 02 hex) required by the MX 7200 GPS Receiver. Bytes 13-20 shown below correspond directly to data bytes 6-13 of the □UTM COORDINATES FOR THE SOUTHWEST CORNER OF LOCAL GRID□ message (ID =17 hex) required by the MX 7200 GPS Receiver. Byte 21 shown below corresponds directly to data byte 3 of the □SET LOCAL DATUM□ message (ID = 0A hex) required by the MX 7200 GPS Receiver. In response to this message the Detection Device reports a □Reference Corner event to the DCI. Map Grid WGS84 is used by the MX7200 GPS Receiver as a default valve.

The value of byte 24 shown below is used directly for the □North DOP Limit (byte 3) and □South DOP Limit (byte 4) of the □SET NAVIGATION DOP LIMITS□ message (ID = 02 hex) required by the MX7200 GPS Receiver. One and a half times the value of byte 24 shown below is used for the □Up (vertical) DOP Limit (byte 5) of the □SET NAVIGATION DOP LIMITS□ message (ID = 02 hex) required by the MX7200 GPS Receiver.

Use: This message is in response to a □Initial Position, Time and Date Request message from the DD. It is sent automatically at initialization.

Format:

Byte #	Hex	Field	Description
1	BB	Sync	Identifies DCI/SAWE/MILES II communication.
2	32	Message ID	Identifies message type.
3	1F	Size	Total message length in bytes.

Format (Set Initial Position, Time and Date - Continued)

4-7	XX	Latitude	Latitude of center of training area. 32 bit signed integer scaled LSB=2^{-23} degrees. North positive. South negative. Range: -90 to +90 degrees. Low byte first.
8-11	XX	Longitude	Longitude of center of training area. 32 bit signed integer scaled LSB=2^{-23} degrees. East positive. West negative. Range: -180 to +180 degrees. Low byte first.
12	XX	UTM Zone	UTM Zone number. Range: 01-3C (hex), 1 to 60 (dec). 8 bits LSB = 1.
13-16	XX...XX	Easting	UTM Easting for SWRC. Range: 0-1,000,000 meters. 32 bit signed integer LSB = 1 meter. Low byte first.
17-20	XX...XX	Northing	UTM Northing for SWRC. Range: 0-20,000,000 meters. 32 bit signed integer LSB = 1 meter. Low byte first.
21	XX	Datum	Local datum selection. Range: 01 through 34 (hex) 01 through 51 (decimal). Examples: 1F = NAD27, 31 = WGS84, and 11 = EUR079.
22-23	XXXX	Altitude	Height above mean sea level. 16 bit signed integer scaled LSB=1 meter. Low byte first.
24	XX	DOP Limits	GPS DOP limits.
25	XX	Year	Year since 1980. 8 bit unsigned integer.
26	XX	Month	8 bit unsigned integer. Range: 1 to 12.
27	XX	Day	8 bit unsigned integer. Range: 1 to 31.
28	XX	Hour	8 bit unsigned integer. Range: 0 to 23.
29	XX	Minutes	8 bit unsigned integer. Range: 0 to 59.
30-31	XXXX	Checksum	Addition of bytes 1 through 29. byte 30 - Most significant byte. byte 31 - Least significant byte.

Name: Set Local Time

Direction: DCI to VDD and
DCI to PDD

Description: Local time is sent to the Detection Device. The Detection Device responds by sending an Acknowledge message to the DCI. Within the Detection Device the real-time clock (RTC) is set and started accordingly. In response, the Detection Device reports a Time Sync/Rollover event to the DCI. The local time data consists of day of week, years since leap year, hours, minutes , seconds , date, month, and year. (See note)

Use: The message is used as part of the time synchronization sequence.

Format:

Byte #	Hex	Field	Description
1	BB	Sync	Identifies DCI/SAWE/MILES II communication.
2	03	Message ID	Identifies message type.
3	0C	Size	Total message length in bytes.
4-10	XX..XX	Data	Local time in BCD. byte 4 - day of week/leap year. Least sig. nibble = number of years since leap year, range: 0 to 3. Most sig. nibble = day of week. 1 - Sunday. 2 - Monday. 3 - Tuesday. 4 - Wednesday. 5 - Thursday. 6 - Friday. 7 - Saturday. byte 5 - hour in BCD, range (dec): 0 to 23. byte 6 - minute in BCD, FF (hex) (not used). byte 7 - second in BCD, FF (hex) (not used). byte 8 - day in BCD, range (dec): 1 to 31. byte 9 - month in BCD, range (dec): 1 (January) to 12 (December). byte 10 - year in BCD, range (dec): 0 to 99.
11-12	XXXX	Checksum	Addition of bytes 1 through 10. byte 11 - Most significant byte. byte 12 - Least significant byte.

Name: *Repeat Command

Direction: DCI to VDD and
DCI to PDD

Description: The command is sent to the Detection Device if there is a discrepancy with the checksum or message length of the received message. After the DCI sends a repeat command to the Detection Device, the Detection Device repeats the last message it sent to the DCI. (see note)

Use: The DCI may send a repeat command to the Detection Device during initialization or normal operation in both centralized and decentralized modes.

Format:

Byte #	Hex	Field	Description
1	BB	Sync	Identifies DCI/SAWE/MILES II communication.
2	3B	Message ID	Identifies message type.
3	05	Size	Total message length in bytes.
4-5	00FB	Checksum	Addition of bytes 1 through 3. byte 4 - Most significant byte. byte 5 - Least significant byte.

* Not implemented by the JMRC DCI or TPU, the Request Missed Events command is used instead.

Name: Request Missed Events

Direction: DCI to VDD and
DCI to PDD

Description: A request for missed events is sent to the Detection Device after the DCI has detected that it has not received some event reports. The DCI examines the event number field within the event reports to determine if it has missed event(s). The Detection Device responds to a Request Missed Events message with Missed Events Report. The DCI can only request a maximum of 15 events at one time. Detection Device report of missed events is limited to last 500 events.

Use: This message is used in both centralized and decentralized modes.

Format:

Byte #	Hex	Field	Description
1	BB	Sync	Identifies DCI/SAWE/MILES II communication.
2	2C	Message ID	Identifies message type.
3	09	Size	Total message length in bytes.
4-7	XX	Data	First and last missed event numbers. Two unsigned integers. Range: 0 to 65535 for each. Last - First < 15 byte 4 - Most significant byte of first event missed. byte 5 - Least significant byte of first event missed. byte 6 - Most significant byte of last event missed. byte 7 - Least significant byte of last event missed.
8-9	XXXX	Checksum	Addition of bytes 1 through 7. byte 8 - Most significant byte. byte 9 - Least significant byte.

Name: Set Vehicle Type

Direction: DCI to VDD

Description: The DCI sends this command to the VDD to set its Vehicle type. The VDD responds with an acknowledge. This command performs a Reset of the VDD. This command is not sent to man-pack detection devices (IWS).

Use: This message is used during initialization and normal operation in both centralized and decentralized modes.

Format:

Byte #	Hex	Field	Description
1	BB	Sync	Identifies DCI/SAWE/MILES II communication.
2	02	Message ID	Identifies message type.
3	06	Size	Total message length in bytes.
4	XX	Vehicle Type	Hex values are: 00 through 0F (Hex) for VDD; see Table A-8. 00 through 0F (Hex) for Aircraft; see Table C-8. 00 through 0F (Hex) for Air Defense; see Table A-8a
5-6	XXXX	Checksum	Addition of bytes 1 through 4. byte 5 - Most significant byte. byte 6 - Least significant byte.

Name: UHF Off

Direction: DCI to VDD and
DCI to PDD

Description: The DCI sends a UHF Off message to the Detection Device which tells the SAWE portion of the Detection Device to request GPS reference receiver data from the DCI. In response to this command, the Detection Device sends an Acknowledge message to the DCI and shuts off its UHF receiver.

Use: This message is used at initialization in centralized mode only.

Format:

Byte #	Hex	Field	Description
1	BB	Sync	Identifies DCI/SAWE/MILES II communication.
2	34	Message ID	Identifies message type.
3	05	Size	Total message length in bytes.
4-5	00F4	Checksum	Addition of bytes 1 through 3. byte 4 - Most significant byte. byte 5 - Least significant byte.

Name: UHF On

Direction: DCI to VDD and
DCI to PDD

Description: The DCI sends a UHF On message to the Detection Device which tells the SAWE portion of the Detection Device to obtain GPS reference receiver data primarily from the UHF link. The DD responds by sending an Acknowledge message to the DCI. In this mode, the Detection Device requests the GPS reference receiver data from the DCI only if it is temporarily unavailable from the UHF link.

Use: This message is used at initialization in decentralized mode only.

Format:

Byte #	Hex	Field	Description
1	BB	Sync	Identifies DCI/SAWE/MILES II communication.
2	35	Message ID	Identifies message type.
3	05	Size	Total message length in bytes.
4-5	00F5	Checksum	Addition of bytes 1 through 3. byte 4 - Most significant byte. byte 5 - Least significant byte.

Name: Unit Configuration Request

Direction: DCI to VDD and
DCI to PDD

Description: The DCI requests the configuration of the Detection Device. The Detection Device reports back its configuration in a a Unit Configuration message as a PDD or VDD and VDD type as applicable. The single data byte contains the interval in seconds that the Detection Device is to send GPS position and velocity updates to the DCI. (see note)

Use: This message is used at initialization and during normal operation in both centralized and decentralized modes. The DCI requests unit configuration during normal operation after a controller key detect event has been reported by the Detection Device. A controller key detect event may indicate that the controller has changed the VDD type.

Format:

Byte #	Hex	Field	Description
1	BB	Sync	Identifies DCI/SAWE/MILES II communication.
2	28	Message ID	Identifies message type.
3	06	Size	Total message length in bytes.
4	XX	GPS Data Update Interval	Number of seconds between each position/velocity report sent from the Detection Device, LSB = 1 second. Maximum = 4 minutes 15 seconds. 00 = no GPS Data Updates are to be sent from the Detection Device.
5-6	XXXX	Checksum	Addition of bytes 1 through 4. byte 5 - Most significant byte. byte 6 - Least significant byte.

Name: UTC Time Start

Direction: DCI to VDD and
DCI to PDD

Description: DCI commands the Detection Device to begin sending UTC Date and Time messages once every second. The DD responds by sending an Acknowledge message to the DCI.

Use: This message is used at initialization and may be used during normal operation in both centralized and decentralized modes.

Format:

Byte #	Hex	Field	Description
1	BB	Sync	Identifies DCI/SAWE/MILES II communication.
2	2A	Message ID	Identifies message type.
3	05	Size	Total message length in bytes.
4-5	00EA	Checksum	Addition of bytes 1 through 3. byte 4 - Most significant byte. byte 5 - Least significant byte.

Name: UTC Time Stop

Direction: DCI to VDD and
DCI to PDD

Description: DCI commands the Detection Device to stop sending UTC Date and Time messages. The DD responds by sending an Acknowledge message to the DCI. After the DCI has received valid time data in a UTC Date and Time message, the DCI sends a UTC Stop Time message to the Detection Device. (Note: There could be additional messages sent (up to 10) after sending this message.)

Use: This message is used at initialization and may be used during normal operation in both centralized and decentralized modes.

Format:

Byte #	Hex	Field	Description
1	BB	Sync	Identifies DCI/SAWE/MILES II communication.
2	2B	Message ID	Identifies message type.
3	05	Size	Total message length in bytes.
4-5	00EB	Checksum	Addition of bytes 1 through 3. byte 4 - Most significant byte. byte 5 - Least significant byte.

APPENDIX C

SMODIM to Data Communications Interface Message Descriptions

Contents

Tables

Name: Acknowledge

Direction: SMODIM to DCI

Description: The SMODIM sends an acknowledge to the DCI after it has received one of the messages shown in Table C-1. The single data byte contains the ID of the message that was received by the SMODIM..

Use: The SMODIM may send an acknowledge to the DCI during initialization or normal operation.

Format:

Byte	Hex	Field	Description
1	BB	Sync	Identifies communication between DCI and SMODIM.
2	40	Message ID	Identifies Message type.
3	06	Size	Total Message length in bytes.
4	XX	Data	Message ID received by the SMODIM, range: 02 to 4A (hex). See Table C-1.
5-6	XXXX	Checksum	Addition of bytes 1 through 4. byte 5 - Most significant byte. byte 6 - Most significant byte.

Table C-1. DCI to SMODIM Messages Requiring An Acknowledge Message Response

Message ID (HEX)	Message Type
02	Set Vehicle Type
03	Local Time
2A	UTC Time Start
2B	UTC Time Stop
2F	Almanac Data
30	Ephemeris Data
31	Differential Data
32	Initial Position, Time, and Date
33	DCI Event Command
4A	Ammo Level Set
	Remote Designation

Name: Almanac Data Request

Direction: SMODIM to DCI

Description: The SMODIM requests almanac data from the DCI for GPS. The DCI responds with an "Almanac Data" message.

Use: This message is used during normal operation..

Format:

Byte	Hex	Field	Description
1	BB	Sync	Identifies communication between DCI and SMODIM.
2	2F	Message ID	Identifies Message type.
3	05	Size	Total Message length in bytes.
4	00EF	Almanac Page #	Page # indicating the type of Almanac data in bytes 5-28 below.
4-5	XXXX	Checksum	Addition of bytes 1 through 3. byte 4 - Most significant byte. byte 5 - Least significant byte.

Name: Ammo Level Request

Direction: DCI to SMODIM

Description: The DCI requests ammo level from the DD. The DD responds with an "Ammo Level' message.

Use: This message is used in normal operations.

Format:

Byte #	Hex	Field	Description
1	BB	Sync	Identifies communication between DCI and SMODIM.
2	49	Message ID	Identifies Message type.
3	05	Size	Total Message length in bytes.
4-5	0109	Checksum	Addition of bytes 1 through 3. byte 4 - Most significant byte. byte 5 - Least significant byte.

Name: Ammo Level Report

Direction: SMODIM to DCI

Description: The SMODIM sends this message to the DD in response to an Ammo Level Request.

Use: This message is used during initialization and normal operation.

Format:

Byte	Hex	Field	Description
1	BB	Sync	Identifies communication between DCI and SMODIM.
2	49	Message ID	Identifies Message type.
3	1D	Size	Total Message length in bytes.
4-11	XX..XX	Rockets	2.75 inch Rocket ammunition levels. Not currently used. The total of the levels for types 0 through 3 must be less than or equal to 76 (dec). byte 4-5: Ammo type 0 - Unused, two byte integer, byte 4 = MSB. Range: 0 to 76 (dec). byte 6-7: Ammo type 1 - Unused, two byte integer, byte 6 = MSB. Range: 0 to 76 (dec). byte 8-9: Ammo type 2 - Unused, two byte integer, byte 8 = MSB. Range: 0 to 76 (dec). byte 10-11: Ammo type 3 - Unused, two byte integer, byte 10 = MSB. Range: 0 to 76 (dec).

Format (Ammo Level Set continued)

12-19	XX..XX	Missile	Missile ammunition levels. The total of the levels for types 0 through 3 must be less than or equal to 16. byte 12-13: Ammo type, two byte integer, byte 12 = MSB. Range: 0 to 16 (dec). byte 14-15: Ammo type, two byte integer, byte 14 = MSB. Range: 0 to 16 (dec). byte 16-17: Ammo type 2, two byte integer, byte 16 = MSB. Range: 0 to 16 (dec). byte 18-19: Ammo type 3, two byte integer, byte 18 = MSB. Range: 0 to 16 (dec).
20-27	XX..XX	Gun System	Gun System ammunition levels. The total of the levels for types 0 through 3 must be less than or equal to 4800 (dec). byte 20-21: Ammo type 0, two byte integer, byte 20 = MSB. Range: 0 to 1200 (dec). byte 22-23: Ammo type 1, two byte integer, byte 22 = MSB. Range: 0 to 1200 (dec). byte 24-25: Ammo type 2, two byte integer, byte 24 = MSB. Range: 0 to 1200 (dec). byte 26-27: Ammo type 3, two byte integer, byte 26 = MSB. Range: 0 to 1200 (dec).
28-29	XXXX	Checksum	Addition of bytes 1 through 27. byte 28 - Most significant byte. byte 29 - Least significant byte.

Name: Differential Data Request

Direction: SMODIM to DCI

Description: The SMODIM requests differential data from the DCI for GPS. The DCI responds with a "Differential Data message".

Use: This message is used during normal operation.

Format:

Byte	Hex	Field	Description
1	BB	Sync	Identifies communication between DCI and SMODIM.
2	31	Message ID	Identifies Message type.
3	05	Size	Total Message length in bytes.
4-5	00F1	Checksum	Addition of bytes 1 through 3. byte 4 - Most significant byte. byte 5 - Least significant byte.

Name: Ephemeris Data Request

Direction: SMODIM to DCI

Description: The SMODIM requests ephemeris data from the DCI for GPS. The DCI responds with a "Ephemeris Data message".

Use: This message is used during normal operation.

Format:

Byte	Hex	Field	Description
I	BB	Sync	Identifies communication between DCI and SMODIM.
2	30	Message ID	Identifies Message type.
3	05	Size	Total Message length in bytes.
4-5	F0	Checksum	Addition of bytes 1 through 3. byte 4 - Most significant byte. byte 5 - Least significant byte.

Name: Event Reports

Direction: SMODIM to DCI

Description: The SMODIM reports the recorded event when it occurs.

Use: This message is used during normal operation.

Format:

Byte #	Hex	Field	Description
1	BB	Sync	Identifies communication between DCI and SMODIM.
2	33	Message ID	Identifies Message type.
3	15	Size	Total Message length in bytes.
4-5	XXXX	Event Number	Index indicating the number of the event report. Unsigned integer. byte 4 - Most significant byte. byte 5 - Least significant byte.
6	XX	Event Code	Varies according to event report type. See table C-2.
7	XX	Event Subcode	Varies according to event report type. See table C-2.
8	XX	Zone of Impact	Varies according to event report type. See table C-2.
9-12	XX..XX	*Position	bytes 9-10 - Local grid Northings. Unsigned integer LSB = 1 meter, range: 0 to 65534 m. Low byte first. The value FFFF (hex) is used to indicate out of range. bytes 11-12 - local grid Eastings. Unsigned integer LSB = 1 meter, range: 0 to 65534 m. Low byte first. The value FFFF (hex) is used to indicate out of range.

* Position is not valid for all event report messages, however, it shall be valid for the following event codes: 1,2,4,6,A,B,E,F,10,29,2D,2E,2F,50-54.

Format (Event Reports - continued)

Byte	Hex	Field	Description
13-14	XX	Player ID	Varies according to event report type. See table C-2.
15-18	XX	Time	Time in BCD. byte 15 - day of week/tenths. Least significant nibble = tenths of second. range: 0 to 9. Most significant nibble = day of week. 1 - Sunday 2 - Monday 3 - Tuesday 4 - Wednesday 5 - Thursday 6 - Friday 7 - Saturday byte 16 - hour in BCD, range: 0 to 23 (dec). byte 17 - minute in BCD, range: 0 to 59 (dec). byte 18 - second in BCD, range: 0 to 59 (dec).
19	0X	ASE Status	Aircraft Survivability Status 00(hex) ALQ-136 Off, ALQ-144 Off 01(hex) ALQ-136 On, ALQ-144 Off 02(hex) ALQ-136 Off, ALQ-144 On 03(hex) ALQ-136 On, ALQ-144 On
20-21	XXXX	Checksum	Addition of bytes 1 through 19. byte 20 - Most significant byte. byte 21 - Least significant byte.

Table C-2. Event Report – Variable Fields

Event Report Type	Event Code (Byte 6)	Event Subcode (Byte 7)	Zone of Impact (Byte 8)	Position (Bytes 9-12)	Player ID (Bytes 13-14)
Vehicle Init.	00 (hex)	00 (hex)	00 (hex)	INVALID	0000 (hex)
Description: The VDD was initialized via a Set Vehicle Type message from a DCI, SLID, or CIS through DCI.					
Resurrection	01 (hex)	00 (hex)	00 (hex)	XXXXXXXX	BBBB (hex)
Description: The DD was resurrected by the DCI. Rounds were not reset.					
Reset	02 (hex)	00 (hex)	00 (hex)	XXXXXXXX	BBBB (hex)
Description: The DD was reset. Rounds were reset to the Load Set at Initialization.					
Optical Resurrection	04 (hex)	1E (hex)	00 (hex)	XXXXXXXX	0000 (hex)
Description: The DD was optically resurrected.					
Controller Key Detect	06 (hex)	00 (hex)	00 (hex)	XXXXXXXX	0000 (hex)
Description: The DD detected the use of a controller key. The DD has been resurrected, reset. DD type may have been changed, or etc.					
Time/Sync Rollover	07 (hex)	Year in BCD, range: 0 to 99 (dec)	00 (hex)	INVALID	byte 13 - month in BCD, range (dec): 1 (JAN) to 12 (DEC) byte 14 - day in BCD, range: 1 to 31 (dec).
Description: The DD received a time sync or the day changed.					

Table C-2. Event Report - Variable Fields

Event Report Type	Event Code (Byte 6)	Event Subcode (Byte 7)	Zone of Impact (Byte 8)	Position (Bytes 9-12)	Player ID (Bytes 13-14)
Weapon Fired	0A (hex)	MILES Weapon Code, see Table C-3 for Aircraft Weapons data, see Table C-8.	Normally 00 (hex). If SAL Hellfire firing event, the Laser Code will be sent. Range: 00 through 07 (hex). [00 = Code A...07 = Code H]	XXXXXXXXX	**Enhanced MILES PID Code, see Table C-7. byte 13 - 1st two PID digits. byte 14 - 2nd two PID digits.

Description: The indicated weapon was fired.

Table C-2. Event Report - Variable Fields

Event Report Type	Event Code (Byte 6)	Event Subcode (Byte 7)	Zone of Impact (Byte 8)	Position (Bytes 9-12)	Player ID (Bytes 13-14)
Trigger Released	0B (hex)	MILES Weapon Code, see Table C-3 for Aircraft Weapons data, see Table C-8.	For Hellfire (Event Subcode = 02) this byte will equal the number of Hellfire's remaining. Range: 00 through FF (hex). For 30 MM Gun (Event Subcode = 15) this byte will equal the number of rounds fired in the burst. Range: 00 through FF (hex).	XXXXXXXXX	**Enhanced MILES PID Code, see Table C-7. byte 13 - 1st two PID digits. byte 14 - 2nd two PID digits.

Description: The indicated weapon's trigger was released.
** If the PID is not decoded properly or is missing (MILES I), a default of "0000" is used.

Table C-2. Event Report - Variable Fields

Event Report Type	Event Code (Byte 6)	Event Subcode (Byte 7)	Zone of Impact (Byte 8)	Position (Bytes 9-12)	Player ID (Bytes 13-14)
Miss	0E (hex)	MILES Weapon Code, See Table C-3.	PDD - 00 (hex) VDD - bit 0 (ls) = zone 1 bit 1 = zone 2 bit 2 = zone 3 bit 3 = zone 4 bit 4-7 = 0	XXXXXXXX	**Enhanced MILES PID Code, see Table C-7. byte 13 - 1st two PID digits. byte 14 - 2nd two PID digits.
Description: A miss by the indicated player was recorded in the DD.					
Hit (VDD only)	0F (hex)	MILES Weapon Code, see Table C-3.	bit 0 (ls) = zone 1 bit 1 = zone 2 bit 2 = zone 3 bit 3 = zone 4 bit 4-7 = 0	XXXXXXXX	**Enhanced MILES PID Code, see Table C-7. byte 13 - 1st two PID digits. byte 14 - 2nd two PID digits.
Description: A hit by the indicated player was recorded in the DD.					

Event Report Type	Event Code (Byte 6)	Event Subcode (Byte 7)	Zone of Impact (Byte 8)	Position (Bytes 9-12)	Player ID (Bytes 13-14)
Kill	10 (hex)	MILES Weapon Code, see Table C-3.	PDD - 00 (hex) VDD - bit 0 (ls) = zone 1 bit 1 = zone 2 bit 2 = zone 3 bit 3 = zone 4 bit 4-7 = 0	XXXXXXXX	**Enhanced MILES PID Code, see Table C-7. byte 13 - 1st two PID digits. byte 14 - 2nd two PID digits.
Description: A hit by the indicated player was recorded in the DD. ** If the PID is not decoded properly or is missing (MILES I), a default of "0000" is used.					
Bit Failure	21 (hex)	SMODIM BIT failures, see Table C-5.	SMODIM/MILES II/DCI BIT failures see Table C-6.	INVALID	byte 13 = CIS initiated - BB otherwise - 00.
Description: BIT was performed in the DD and failure(s) were detected.					
Reference Corner	25 (hex)	00 (hex)	00 (hex)	INVALID	INVALID
Description: The DD received southwest reference corner data.					
Initialization	29 (hex)	00 (hex)	00 (hex)	XXXXXXXX	BBBB (hex)
Description: The DD was initialized by an Initialize Event command.					

Table C-2. Event Report - Variable Fields

Event Report Type	Event Code (Byte 6)	Event Subcode (Byte 7)	Zone of Impact (Byte 8)	Position (Bytes 9-12)	Player ID (Bytes 13)	Player ID (Byte 14)
Radar Altitude	50 (hex)	(MSB) Radar Altitude in feet. Range: 00 to FF (hex).	(LSB) Radar Altitude in feet. Range: 00 to FF (hex).	XXXXXXXX	00 (hex)	00 (hex)

Description: Radar Altitude in feet Above Ground Level (AGL). Byte 7 + Byte 8 = Radar Altitude in feet AGL. Byte 7 is MSB, Byte 8 is LSB. This event is sent when the Radar Altitude changes by + 25 ft. Event reporting due to changes is limited to a maximum rate established by the SMODIM Unit Configuration Request; the default condition is for the SMODIM to disable Radar Altitude event reporting.

Heading	51 (hex)	(MSB) Aircraft Heading (True) in degrees. Range: 00 to FF (hex).	(LSB) Aircraft Heading (True) in degrees. Range: 00 to FF (hex).	XXXXXXXX	(MSB)Sensor Azimuth (True) in degrees. Range: 00 to FF (hex).	(LSB)Sensor Azimuth (True) in degrees. Range: 00 to FF (hex).

Description: Aircraft Heading in degrees (True). Byte 7 + Byte 8 = Aircraft Heading in degrees (True). Byte 7 is MSB and Byte 8 is LSB, Sensor Azimuth in degrees (True). Byte 13 + Byte 14 = Sensor Azimuth in degrees (True). Byte 13 is MSB and Byte 14 is LSB. This event is sent with every Hellfire event, 30 mm gun event, laser event, rocket firing event, and if the aircraft heading or Sensor Azimuth changes by 5 degrees or more. Event reporting due to changes is limited to a maximum update rate established by the SMODIM Unit Configuration Request; the default condition is for the SMODIM to disable Heading event reporting.

Table C-2. Event Report - Variable Fields

Event Report Type	Event Code (Byte 6)	Event Subcode (Byte 7)	Zone of Impact (Byte 8)	Position (Bytes 9-12)	Player ID (Bytes 13)	Player ID (Byte 14)
Range	52 (hex)	(MSB) Range in meters. Range: 00 to FF (hex).	(LSB) Range in meters. Range: 00 to FF (hex).	XXXXXXXX	(MSB) Gun Azimuth (True) in degrees. Range: 00 to FF (hex).	(LSB) Gun Azimuth (True) in degrees. Range: 00 to FF (hex).
Description: Range in meters. Byte 7 + Byte 8 = Range in meters. Byte 7 is MSB and Byte 8 is LSB. Gun Azimuth in degrees (True). Byte 13 + Byte 14 = Gun Azimuth in degrees (True). Byte 13 is MSB and Byte 14 is LSB. This event is sent with every laser, Hellfire, 30 mm gun, and rocket event.						
Aircraft Survivability Equipment (ASE) Status	53 (hex)	00 (hex)	00 (hex)	XXXXXXXX	0000 (hex)	
Description: Status of ASE equipment on board the aircraft. This event is sent upon initialization and whenever the status changes. The ASE status is encoded in Byte 19.						
Laser Event	54 (hex)	Laser On - 00 (hex) Laser Off - 01 (hex)	Laser Desig-nation Code, Range: 00 through 07 (hex) [00 = Code A... 07 = Code H]	XXXXXXXX	For event subcode = 00, = 0000 (hex). For event subcode = 01, byte 14 equals the duration of the laser event in seconds, range = 00 to FF (hex).	
Description: Laser Event is sent when the laser designator trigger is pulled and when the trigger is released.						

Table C-3. MILES Weapon Code Definitions

Event Subcode (Hex)	MILES Weapon
00	Universal Kill (Control Gun), Continuous 00 for weapon boresighting
01	Missile: Maverick (various Aircraft)
02*1*	Missile: Hellfire (AH64, AH58).
03*1*	Missile: AT-3 Sagger (BMP1, BRDM-1, HIND-D, Man), [MILES I: AT-8 Songster (T-80)].
04	Mortar: 60mm (Man), 81mm, 107mm (4.2in.), 120mm, 160mm, 240mm (Various GV, Man)
05	Mine: M15 Track Cutter [MILES I: Gun AA: 23mm (Radar Mode) (ASETIV)]
06	Weapon X
07*1*	Missile: TOW ATGW (M2, M3, AH6, AH64, AH1S, LAV-25, M113, M901, HMMWV, Man), Shillelagh (M551), AT4 Spigot (Man), [MILES I: AT-5 Spandrel ATGW (BMP2, BRDM, HIND-D)], AT-6 Spiral ATGW (HIND-D), AT-8 Songster (T-80)
08*1*	Missile ATGW: M47 Dragon (Man), AT-5 Spandrel (BMP2, BMP2C, BRDM2, HIND-E) Rocket AT: RPG-16 (Man)
09	Flame Thrower: M202 (Man)
0A	Mine: M21 AT (Man) Main Gun: 125mm (T72, T80)
0B	Mine: M81A1 Claymore AP (Man)
0C	Main Gun: 105mm (M1, M60 variants)
0D	Howitzer: 152mm (M1973), 122mm(M1974), 155mm (M109), 100mm (M1944) Rocket: 122mm BM21 (truck)
0E	Rocket: 2.75in (AH-64, AH-1S), 57mm Rocket, (HIND-D, HIND-E) Main Gun: 73 mm (BMP1)
0F	Rocket: 66mm M72 LAW (Man), 70mm Viper (Man)
10	Main Gun: 120mm (M1A1, M1A2 Tank)
11	Rifle (Recoilless): 90mm (Man)
12	Howitzer: 203mm (8 inch) (M110A2), 105mm (M102, M108), 122mm, 155mm (M109A2, M198)
13	Grenade: 40mm Mark 19 AGS, 40mm M203 Grenade (HMMWV, Man)
14	Bomb, Cluster: Rockeye (various Aircraft)
15	Gun: 30mm GAU-8 Avenger (various Aircraft)
16	Gun, AA: 23mm (ZSU_23/4 or ASET IV in Visual Mode) Main Gun: 25mm (M2A2, M3A2, LAV-25)
17	Gun, AA: 20mm Vulcan (M163, M167, AH-1S) Main Gun: 30mm (BMP2, BMP2C, HIND-D)
18	Machine Gun .50 cal (12.7mm): M2, M85, etc. (Various GV, RW, Man)
19	Missile (SAM): Chaparral (M548, M730), SA-9 Gaskin (BRDM-2 Chassis), SA-13 Gopher (BRDM-2 Chassis), [MILES I: Stinger (AH-58, OH-58D)], ASET IV

Table C-3. MILES Weapon Code Definitions

Event Subcode (Hex)	MILES Weapon
1A	Missile (SAM): Stinger (AH-58, OH-58D. HMMWV, Man), [MILES I: SA-9 Gaskin (ASETIV RF/IR), SA-13 Gopher (ASETIV)
1B*1*	Rifle: .22 cal (5.56mm) M16 Machine Gun .30 cal (7.62mm): M60, M240, Coax, etc. (Various GV, Man) Missile: Hellfire, AT-3 Sagger , TOW, Shillelagh, AT-5 Spandrel, AT-6 Spiral, AT-8 Songster, M47 Dragon (PPD kill codes are transmitted by these missiles after they transmit MILES codes 02, 03, 07, or 08. The PDD reports an Event Subcode 1B when killed by these missiles. All other DDs report Events Subcodes 02, 03, 07, 04 and do not report 1B.)
1C	Heavy Miss: 105mm, 152mm, 73mm, Viper (LAW), etc.
1D	Light Miss: Rifle, Machine Gun, 20mm, etc.
1E	Optical Reset (Controller Gun)
1F	Spare
20	Not Used in Standard MILES Equipment
21	Missile (SAM): SA-14 Gremlin (Man)
22	Gun AA: 23mm (ZSU-23/4 Radar Mode)
23	Not Used in Standard MILES Equipment
24	Not Used in Standard MILES Equipment

1 PDD's killed by the missiles associated with Event Subcodes 02, 03, 07, and 08 report Event Subcode 1B instead of codes 02, 03, 07, or 08. All other DDs report the Event Subcodes 02, 03, 07, or 08.

Table C-4. Indirect Fire Weapon Types

Event Subcode (Hex)	Weapon Type
Artillery/Mortar	
00	(reserved)
01	M720-PD, 60mm HE
02	M821-PD, 81mm HE
03	M1-PD, 105mm HE
04	M1-VT, 105mm HE
05	M444, 105mm APICM
06	M107-PD, 155mm HE
07	M107-VT, 155mm HE
08	M449A1, 155mm APICM
09	M483A1, 155mm DPICM
0A	M106-PD, 8 inch HE
0B	M106-VT, 8 inch HE
0C	M404, 8 inch APICM
0D	M509A1, 8 inch DPICM
0E	M26, MLRS DPICM
0F	MK49, 5 inch 38 HE
10	MK56, 5 inch AAC
11	MK61, 5 inch HE
12	MK41, 5 inch 54 AAC
13	MK25, 8 inch HE
14	MK13, 16 inch HE
15	MG-76-PD, 76mm HE
16	VO82-PD, 82mm HE
17	OF843A-PD, 120mm HE
18	OF843A-VT, 120mm HE
19	OF24-PD, 122mm HE
1A	OF24-VT, 122mm HE
1B	F864-PD, 240mm HE
1C	F864-VT, 240mm HE
1D	OF482-PD, 130mm HE
1E	OF482-VT, 130mm HE
1F	OF25-PD, 152mm HE
20	OF25-VT, 152mm HE
21	XDP540, 052mm DPICM
22	F620-PD, 203mm HE
23	F620-VT, 203mm HE
24	XDP620, 203mm DPICM
25	9M22YF-PD, 132mm MRL HE
26	9M22KX, 122mm MRL HE
27	9M27F-PD, 220mm MRL DPICM
28	9M27KX, 220mm MRL DPICM
29	FROG-PD, 540mm Rocket

Table C-4. Indirect Fire Weapon Types

Event Subcode (Hex)	Weapon Type
2A	CONV042
.	.
.	.
C8	CONV200
RF-Mine	
C9	MINE
CA	MINE-2
CB	MINE-3
CC	MINE-4
CD	MINE-5
Chemical	
CE	CHEMA1 (blister)
CF	CHEMB1 (nerve I)
D0	CHEMB2 (nerve U)
D1	CHEMC1 (blood I)
D2	CHEMC2 (blood U)
D3	CHEMD1 (choking I)
D4	CHEMD2 (choking U)
D5	CHEME1
D6	CHEME2
D7	CHEMF1
D8	CHEMF2
D9	CHEMG1
DA	CHEMG2
DB	CHEMH1
DC	CHEMH2
DD	CHEMI1
DE	CHEMI2
DF	CHEMJ1
E0	CHEMJ2
Nuclear	
E1	W10 Y-1
E2	W10 Y-2
E3	W15 Y-1
E4	W15 Y-2
E5	W20 Y-1
E6	W20 Y-2
E7	W30 Y-1
E8	W20 Y-2
E9	W30 Y-3
EA	W40 Y-1

Table C-4. Indirect Fire Weapon Types

Event Subcode (Hex)	Weapon Type
Nuclear (cont.)	
EB	W40 Y-2
EC	W50 Y-1
ED	W50 Y-2
EE	W50 Y-3
EF	NUC7
F0	NUC8
F1	NUC9
F2	NUC10
F3	EXP
MES	
F4	AT-MES
F5	AP-MES
F6-FE	(spares)
FF	Power On Kill

Table C-5. SMODIM BIT Failures

A "1" in a bit position indicates the corresponding unit failed. Bit assignments are:

(MSB)	bit 7 - TBD
	bit 6 - TBD
	bit 5 - TBD
	bit 4 - TBD
	bit 3 - TBD
	bit 2 - TBD
	bit 1 - TBD
(LSB)	bit 0 - TBD

Table C-6. MILES/AGES II/SMODIM BIT Failures

A "1" in a bit position indicates the corresponding unit failed. Bit assignments are:

(MSB)	bit 7 - not assigned
	bit 6 - not assigned
	bit 5 - not assigned
	bit 4 - not assigned
	bit 3 - not assigned
	bit 2 - not assigned
	bit 1 - SMODIM failed
(LSB)	bit 0 - MILES/AGES II failed

Table C-7. Enhanced MILES/AGES II Player ID Codes

DD CONSOLE NUMBER	AMMO TYPE	BLUEFOR ENHANCED PID (Even Only)	OPFOR ENHANCED PID (Odd Only)
001..165	AMMO 0	0002-0330	0001-0329
166..330	AMMO 0	1002-1330	1001-1329
331..495	AMMO 0	2002-2330	2001-2329
496..660	AMMO 0	3002-3330	3001-3329
001..165	AMMO 1	4002-4330	4001-4329
166..330	AMMO 1	5002-5330	5001-5329
331..495	AMMO 1	6002-6330	6001-6329
496..660	AMMO 1	7002-7330	7001-7329

Table C-7. Enhanced MILES/AGES II Player ID Codes (cont.)

DD CONSOLE NUMBER	AMMO TYPE	BLUEFOR ENHANCED PID (Even Only)	OPFOR ENHANCED PID (Odd Only)
001..165	AMMO 2	8002-8330	8001-8329
166..330	AMMO 2	9002-9330	9001-9329

331..495	AMMO 2	A002-A330	A001-A329
496..660	AMMO 2	B002-B330	B001-B329
001..165	AMMO 3	C002-C330	C001-C329
166..330	AMMO 3	D002-D330	D001-D329
331..495	AMMO 3	E002-E330	E001-E329
496..660	AMMO 3	F002-F330	F001-F329

Notes on Table C-7:

In accordance with the Standard for MILES Communication Code Structure, PMT 90-S002, the Enhanced MILES/AGES II PID is represented by 2 bytes (16 bits) as follows:

AMMO TYPE	bits 0..1	= 0..3 (decimal)	(Ammo types 0,1,2,&3)
EXTENDED PID	bits 2..3	= 0..3 (decimal)	(most significant digit of PID)
BASIC PID	bits 4..15	= 1..330 (BCD)	(3 least significant digits of PID)

The PID is obtained by masking the AMMO TYPE and then concatenating the EXTENDED PID to the BASIC PID. An example would be: EXTENDED PID = 1, BASIC PID = 234, the PID would be 1234. The BASIC PID ranges from 1 to 330, therefore the concatenation of the two results in gaps in the PID's as follows:

EXTENDED PID 0 + BASIC PID (1..330) = 0001..0330,
EXTENDED PID 1 + BASIC PID (1..330) = 1001..1330,
EXTENDED PID 2 + BASIC PID (1..330) = 2001..2330,
EXTENDED PID 3 + BASIC PID (1..330) = 3001..3330.

Notes on Table C-7: (Cont.)

CONSOLE NUMBER: The console number of a DD in combination with the setting of the vehicle type (OPFOR or BLUEFOR vehicle) is what determines the PID for a DD. The consoles are numbered sequentially, however as shown above, the PID's are not sequential. The following shows PID assignments for various consoles:

CONSOLE 1	OPFOR VEH = PID 1	BLUEFOR VEH = PID 2
CONSOLE 2	OPFOR VEH = PID 3	BLUEFOR VEH = PID 4
CONSOLE 3	OPFOR VEH = PID 5	BLUEFOR VEH = PID 6
.	.	.
CONSOLE 165	OPFOR VEH = PID 329	BLUEFOR VEH = PID 330
CONSOLE 166	OPFOR VEH = PID 1001	BLUEFOR VEH = PID 1002
.	.	.
CONSOLE 330	OPFOR VEH = PID 1329	BLUEFOR VEH = PID 1330
CONSOLE 331	OPFOR VEH = PID 2001	BLUEFOR VEH = PID 2002
.	.	.
CONSOLE 495	OPFOR VEH = PID 2329	BLUEFOR VEH = PID 2330
CONSOLE 496	OPFOR VEH = PID 3001	BLUEFOR VEH = PID 3002
.	.	.
CONSOLE 660	OPFOR VEH = PID 3329	BLUEFOR VEH = PID 3330

The maximum number of vehicles available before a PID is duplicated is 660 per vehicle type/platform. Within each console two PIDs, one BLUEFOR and one OPFOR, for a total of 1320 unique PIDs. The PIDs associated with the BLUEFOR consoles are even integers and with the OPFOR consoles are odd integers.

The maximum number of PDD’s available before a PID is duplicated is 5280.

Table C-8. Aircraft Weapons Data

SMO DIM Type (hex)	Aircraft Type	SMODIM Host Type	JMRC Actual Vehicle	Weapon	Type Number	MILES Code (hex)	Basic Load	Init Load	Reload Time (sec)	Reload Qty	Track Time (sec)	WPN Fired Trigger Rel.
0	AH-64	AGES II	AH-64	Rocket	2.75" Rckt	0E	0	0	0	0	0	WFTR
	Apache			Missile	Hellfire	02	16	16	0	1	7	WFTR
				Gun	30mm	15	1200	1200	0	0	0	WFTR
1	OH-58D	AGES II	OH-58D	Rocket	Stinger	1A	?	?	0	0	0	WF
	Kiowa			Missile	Hellfire	02	?	?	0	1	7	WFTR
				Gun	7.62/50cal	18	500	500	0	????	0	WFTR
2	UH-60	AGES II Black Hawk	UH-60	NONE								
3	CH-47	AGES II Chinook	CH-47	NONE								
4	AH-64D			Rocket	2.75” Rckt		0	0	0	0	0	WFTR
	Longbow			Missile	Hellfire/RF	02	16	16	0	1	7	WFTR
	Apache			Gun	30 mm	15	1200	1200	0	0	0	WFTR

Name: * Initial Position, Time, and Date Request

Direction: SMODIM to DCI

Description: The SMODIM requests initial position, time, and date data from the DCI for GPS.

Use: This message is used during normal operation.

Format:

Byte #	Hex	Field	Description
1	BB	Sync	Identifies communication between DCI and SMODIM.
2	32	Message ID	Identifies Message type.
3	05	Size	Total Message length in bytes.
4-5	00F2	Checksum	Addition of bytes 1 through 3. byte 4 - Most significant byte. byte 5 - Least significant byte.

Name: Missed Events Report

Direction: SMODIM to DCI

Description: The SMODIM sends all of the events indexed by the "Request Missed Events" message in the format defined for the "Event Report" (message ID = 33 hex). The data blocks (16 bytes each) of up to 15 event reports that were missed by the DCI are grouped into the data block of this message.

Use: This message is used in normal operations.

Format:

Byte	Hex	Field	Description
1	BB	Sync	Identifies communication between DCI and SMODIM.
2	3B	Message ID	Identifies Message type.
3	05	Size	Total Message length in bytes. Variable.
4 to 16(M-N)+19	XX	Data	Data bytes 4 through 19 of event report number N through event report number M.
16(M-N)+20 to 16(M-N)+21	XXXX	Checksum	Addition of bytes 1 through 16(M-N)+19. byte 16(M-N)+20 - Most significant byte. byte 16(M-N)+21 - Least significant byte.

Name: Missed Events Report

Direction: SMODIM to DCI

Description: The SMODIM sends all of the events indexed by the "Request Missed Events" message in the format defined for the "Event Report" (message ID = 33 hex). The data blocks (16 bytes each) of up to 15 event reports that were missed by the DCI are grouped into the data block of this message.

Use: This message is used in normal operations.

Format:

Byte	Hex	Field	Description
1	BB	Sync	Identifies communication between DCI and SMODIM.
2	3B	Message ID	Identifies Message type.
3	05	Size	Total Message length in bytes. Variable.
4 to 16(M-N)+19	XX	Data	Data bytes 4 through 19 of event report number N through event report number M.
16(M-N)+20 to 16(M-N)+21	XXXX	Checksum	Addition of bytes 1 through 16(M-N)+19. byte 16(M-N)+20 - Most significant byte. byte 16(M-N)+21 - Least significant byte.

Name: Unit Configuration Report

Direction: SMODIM to DCI

Description: The Detection Device reports its unit configuration in response to a "SMODIM Unit Configuration Request" from the DCI.

Use: This message is used in normal operations.

Format:

Byte	Hex	Field	Description
1	BB	Sync	Identifies communication between DCI and SMODIM.
2	28	Message ID	Identifies Message type.
3	08	Size	Total Message length in bytes.
4	XX	Unit Configuration	Hex values are: Least significant nibble 2 - SMODIM Most significant nibble 0 through 3 - Aircraft Type; see Table C-8.
5-6	XXXX	Player ID	Byte 5 - Leading two digits of the DD player ID. Byte 6 - Trailing two digits of the DD player ID. See Table C-7.
7-8	XXXX	Checksum	Addition of bytes 1 through 6. byte 7 - Most significant byte. byte 8 - Least significant byte.

Name: UTC Date and Time Report

Direction: SMODIM to DCI

Description: The GPS UTC date and time data is reported to the DCI. Bytes 4-14 shown below correspond directly to data bytes 3-13 of the "UTC DATE AND TIME" message (ID = D1 hex) provided by the MX 7200 GPS Receiver. The Detection Device begins sending the UTC date and time data from the GPS once every second after it has received a "UTC Time Start" message from the DCI. The Detection Device stops sending the UTC date and time data after it has received a "UTC Time Stop" message from the DCI. The Detection Device provides the UTC date and time data to the DCI within 0.5 sec of reading it from GPS.

Use: This message is used during normal operation.

Format:

Byte	Hex	Field	Description
1	BB	Sync	Identifies communication between DCI and SMODIM.
2	3E	Message ID	Identifies Message type.
3	10	Size	Total Message length in bytes.
4	XX	Year	Year since 1980. 8 bit unsigned integer.
5	XX	Month	8 bit unsigned integer. Range: 01-0C (hex) 01 - January to 12 - December.
6	XX	Day	8 bit unsigned integer. Range: 01-1F (hex) 1 to 31 (dec).
7	XX	Hour	8 bit unsigned integer. Range: 01-17 (hex), 0 to 23 (dec)
8	XX	Minutes	8 bit unsigned integer. Range: 01-3B (hex), 0 to 59 (dec).
9	XX	Seconds	8 bit unsigned integer. Range: 01-3B (hex), 0 to 59 (dec).

Format (UTC Date and Time continued)

10-13	XX..XX	Fraction of Second	32 bit unsigned integer scaled LSB = 2^{-32} seconds.
14	XX	Data	Type of information available. Hex values: 01 - Approximate time taken from battery backed up clock on MX 7200 digital PCB. 02 - Accurate time obtained during GPS satellite navigation. NOTE: Other Hex values (00, 03 to FF) which are undefined may be returned. Messages containing these values should not be used.
15-16	XXXX	Checksum	Addition of bytes 1 through 14. byte 15 - Most significant byte. byte 16 - Least significant byte.

Name: Velocity Report

Direction: SMODIM to DCI

Description: The GPS velocity data is reported to the DCI. Bytes 4-11 shown below correspond directly to data bytes 3-10 of the "FILTERED NAV VELOCITY" message (ID = D9 hex) provided by the MX 7200 GPS Receiver. The Detection Device obtains velocity from GPS and sends it to the DCI at a regular interval. The data field of the "Unit Configuration Request" message defines the interval in seconds between position/velocity updates. This message immediately follows the "Position" message from the Detection Device.

Use: This message is used during normal operations.

Format:

Byte #	Hex	Field	Description
1	BB	Sync	Identifies communication between DCI and SMODIM.
2	2D	Message ID	Identifies Message type.
3	0D	Size	Total Message length in bytes.
4-5	XXXX	Velocity North	Scaled LSB = 2^{-5} meters/second. Low byte first.
6-7	XXXX	Velocity East	Scaled LSB = 2^{-5} meters/second. Low byte first.
8-9	XXXX	Velocity Up	Scaled LSB = 2^{-5} meters/second. Low byte first.
10-11	XXXX	Frequency Offset	Scaled LSB = 2^{-5} meters/second. Low byte first.
12-13	XXXX	Checksum	Addition of bytes 1 through 11. byte 12 - Most significant byte. byte 13 - Least significant byte.

Name: LBA Event Message

Direction: SMODIM to DCI LBA

Description: Due to special nature of LBA engagements, use following messages will be sent.

Use: This message is used during LBA engagements..

Format:

Byte #	Hex	Field	Description
1	BBH	SAWE_SYNC	Identified communication between SMODIM and DCI
2	34H	SAWE_DATA_MESSAGE_ID	Identifies Longbow Weapon Event Report
3	25H	SAWE_MESSAGE_SIZE	Total message length in bytes
4-5		SAWE_EVENT_NUMBER	Index indicating number of event report
6		*LBA_EVENT_CODE	Identified Longbow weapon fire event
		Range/Values	00=> lba_pri_loc 01=> lba_pri_loc_to_be_followed_by_sec 02=> lba_sec_loc 03=> lba_firing_remote_laser_code 04=> laser_on 05=> laser_off 06=> laser_code_change
		Units:	N/A
		Precision:	N/A
		Format:	1-byte enumeration type
7		*LBA_EVENT_SUBCODE	Identifies the Longbow weapon type
		Range/Values:	00=> Laser 01=> Gun 02 => SAL Hellfire 03 => RF Hellfire 04 => Rocket
		Units:	N/A
		Precision:	N/A
		Format:	1-byte enumeration type
8-9		SAWE_NORTHING	Aircraft position at event time

Byte #	Hex	Field	Description
10-11		SAWE_EASTING	Aircraft position at event time
12-15		*LBA_TIME	passes event time in BCD
		Range/Values: See Below Units: See Below Precision: See Below Format: 4-byte BCD	
		byte 1 (LCN) SAWE_TENTHS_OF_SECONDS	tenths of second (BCD)
		byte 1 (MSN) SAWE_DAY_OF_WEEK	day of week (enumerated)
		byte 2 SAWE_BCD_HOUR	hour of day (BCD)
		byte 3 SAWE_BCD-MINUTE	minutes past the hour (BCD)
		byte 4 SAWE_BCD_SECONDS	seconds past the min (BCD)
16-17		SAWE_NORTHING	Aimpoint COM nothing
18-19		SAWE_EASTING	Aimpoint COM easting
20-23		*LBA TIME	Passes acquisition time in BCD
24-25		**LBA**_Velocity	Target velocity northing
			Range/Values: -32768..32767 **Units: m/s** **Precision: 2^{-4} m/s per LSB** **Format: 2-byte signed integer LSB first**
26-27		**LBA**_Velocity	Target velocity easting
			Range/Values: -32768..32767 **Units: m/s** **Precision: 2^{-4} m/s per LSB** **Format: 2-byte signed integer LSB first**
28		*LBA_ROUNDS	Rounds remaining on helicopter after shot (missile) on rounds fired (gun/rocket)

Byte # Hex Field Description

		Range/Values:	0..255
		Units:	Missiles/rounds
		Precision:	1 missile or 1 round
		Format:	1-byte unsigned integer
29	*LBA_DELTA_AZIMUTH		Footprint delta azimuth
		Range/Values:	0..255
		Units:	Meters (for SAL missiles 255=2000M)
		Precision:	**1** mrad/LSB Represents ½ total Footprint
		Format:	1-byte unsigned integer
30	*LBA_DELTA_RANGE		Footprint delta range
		Range/Values:	0..255
		Units:	Meters (for SAL Missiles 255=20000M)
		Precision:	2 meters/LSB represents ½ total footprint
		Format:	1-byte unsigned inter
31	*LBA_TOF		Passes time of flight for SAL, and Rocket events
		Range/Value:	0..255
		Units:	Seconds
		Precision:	0.2 seconds/LSB
		Format:	1 byte unsigned integer
32	*LBA_PROB_HIT		Probability of hit hard target
		Range/Value:	0..**255**
		Units	Percent
		Precision:	**0.392** Percent/LSB
		Format:	1-byte unsigned integer
33-34	*LBA_LASER_CODE		Alpha code plus Tri-service octal (missile laser code)

Byte #	Hex	Field	Description
			Range/Value: 0..FFFF Units: N/A Precision: N/A Format: 2-byte unsigned integer upper nibble = alpha missile code **MSB First**
35		*LBA_LAUNCH_MODE	Missile launch mode or Rocket type Range/Value: if missile event 0 =>LOAL 1 =>LOBL 2 =>LOBL**O** if rocket event 0 =>**6PD** 1 =>**6MP** **2 =>Others** Units: N/A Precision: N/A Format: 1-byte unsigned integer
36-37	SAWE_CHECKSUM		

Name: LBA Missed Event Message (29H)

Direction: SMODIM to DCI LBA

Description:

Use:

Format:

Byte #	Hex	Data Element	Description
1	BB	SAWE_SYNC	
2	29H	SAWE_DATA_MESSAGE_ID	Missed SMODIM events
3		SAWE_MESSAGE_SIZE	(Size of message in bytes
4		SAWE_DATA_MESSAGE_ID	Type of Message
5-36		Message Data	

Bytes 4-36 will be repeated as necessary for however many messages there are up to a maximum of 7. In LBA messages the first byte (byte 4 in this case) will be the type of message (either 33H for RDMS event report or 34H for Longbow event report). If it is a Longbow event, it will take up bytes 5-36.
37 + N *33 to 37 + N * 33 + 1 SAWE_CHECKSUM Checksum for message

APPENDIX D

Data Communications
Interface to SMODIM Message Descriptions

Contents

Tables

Name: Almanac Data

Direction: DCI to SMODIM

Description: The DCI sends page 135 of almanac data to the SMODIM. The SMODIM responds with an Acknowledge message. The SMODIM passes the almanac data to the GPS. Bytes 4-28 shown below correspond directly to data bytes 3-27 of the "SET ONE PAGE OF ALMANAC' message (ID = OE hex) used by the MX7200 Receiver.

Use: This message is in response to an 'Almanac Data Request' message from the SMODIM (not currently implemented in the JMRC DD). In centralized mode, it is sent automatically at initialization and then once every 24 hours.

Format:

Byte	Hex	Field	Description
1	BB	Sync	Identifies communication between DCI and SMODIM.
2	2F	Message ID	Identifies Message type.
3	1E	Size	Total Message length in bytes.
4	87	Almanac Page #	Page # indicating the type of Almanac data in bytes 5-28 below.
5-28	XX ... XX	Almanac Data	Page 135 (dec) of Almanac data which includes ionosphere and UTC Parameters. Twenty four bytes packed in GPS-ICD-200 with parity bits, HOW and TLM words removed.
29-30	xxxx	Checksum	Addition of bytes 1 through 28. byte 29 - Most significant byte. byte 30 - Least significant byte.

Name: Ammo Level Request

Direction: DCI to SMODIM

Description: The DCI requests ammo level from the DD. The DD responds with an "Ammo Level' message.

Use: This message is used in normal operations.

Format:

Byte #	Hex	Field	Description
1	BB	Sync	Identifies communication between DCI and SMODIM.
2	49	Message ID	Identifies Message type.
3	05	Size	Total Message length in bytes.
4-5	0109	Checksum	Addition of bytes 1 through 3. byte 4 - Most significant byte. byte 5 - Least significant byte.

Name: Ammo Level Set

Direction: DCI to VDD

Description: The DCI sends this command to the VDD to set its ammunition level. The VDD responds with an acknowledge.

Use: This message is used during initialization and normal operation in both centralized and decentralized modes.

Format:

Byte #	Hex	Field	Description
1	BB	Sync	Identifies DCI/SAWE/MILES II communication.
2	4A	Message ID	Identifies message type.
3	1E	Size	Total message length in bytes.
4	XX	Vehicle Type	Hex values are: 00 through 0F (hex); see table A-8.
5-12	XX	Weapon 1	Weapon 1 ammunition levels. The total of the levels for ammo types 0 through 3 must be less than or equal to 9900. byte 5-6 Ammo type 0 - APDS (default), two byte integer, byte 5 = MSB. Range: 0 to 9900 (dec). byte 7-8 Ammo type 1 - HEAT, two byte integer, byte 7 = MSB. Range: 0 to 9900 (dec). byte 9-10 Ammo type 2 - unused, two byte integer, byte 9 = MSB. Range: 0 to 9900 (dec). byte 11-12 Ammo type 3 - unused, two byte integer, byte 11 = MSB. Range: 0 to 9900 (dec).

13-20	XX	Weapon 2	Weapon 2 ammunition levels. The total of the levels for ammo types 0 through 3 must be less than or equal to 99. byte 13-14 Ammo type 0, two byte integer, byte 13 = MSB. Range: 0 to 99 (dec). byte 15-16 Ammo type 1, two byte integer, byte 15 = MSB. Range: 0 to 99 (dec). byte 17-18 Ammo type 2, two byte integer, byte 17 = MSB. Range: 0 to 99 (dec). byte 19-20 Ammo type 3, two byte integer, byte 19 = MSB. Range: 0 to 99 (dec).
21-28	XX	Weapon 3	Weapon 3 ammunition levels. The total of the levels for ammo types 0 through 3 must be less than or equal to 9900. byte 21-22 Ammo type 0, two byte integer, byte 21 = MSB. Range: 0 to 9900 (dec). byte 23-24 Ammo type 1, two byte integer, byte 23 = MSB. Range: 0 to 9900 (dec). byte 25-26 Ammo type 2, two byte integer, byte 25 = MSB. Range: 0 to 9900 (dec). byte 27-28 Ammo type 3, two byte integer, byte 27 = MSB. Range: 0 to 9900 (dec).
29-30	XXXX	Checksum	Addition of bytes 1 through 28. byte 29 - Most significant byte. byte 30 - Least significant byte.

Name: DCI Event Commands

Direction: DCI to SMODIM

Description: A DCI Event Command is sent to the Detection Device. The Detection Device responds to the command by sending an Acknowledge message to the DCI. DCI Event Commands are initiated by the DCI, or other external means, and forwarded through the DCI to the DD.

Use: These messages are used during normal operation.

Format:

Byte	Hex	Field	Description
1	BB	Sync	Identifies communication between DCI and SMODIM.
2	33	Message ID	Identifies Message type.
3	07	Size	Total Message length in bytes.
4	xx	Event Code	Identifies DCI Event Command type. See Table D-1 for descriptions. Hex values are: 00 - Initialize 01 - BIT 02 - Reset 03 - Resurrect 04 - Miss 05 - Hit 06 - Kill
5	xx	Event Subcode	Varies according to DCI Event Command type. See Table C-2. Event Code: 00,02,03 — Event Subcode: 00 (hex) Event Code: 01 (BIT) — Event Subcode: A "1" in a bit position indicates the corresponding module failed. Bit assignments are: TBD Event Code: 04,05,06 — Event Subcode: Indirect Fire Weapon Type. See Table C-4. D-7

Format (DCI Event Commands continued)

Byte #	Hex	Field	Description
6-7	xxxx	Checksum	Addition of bytes 1 through 5. byte 6 - Most significant byte. byte 7 - Least significant byte.

Table D-1. DCI Event Command Descriptions

Command Type	Description
Initialize	The DCI commands the Detection Device (DD) to initialize. The DD is given a full ammunition count, is made alive if dead, its event memory is cleared, and BIT is not executed as a result of this command. An initialization event is reported to the DCI.
BIT	The DCI commands the Detection Device (DD) to perform BIT. The single data byte contains the results of the self-test. The results of the DD BIT are displayed at the DD together with the DCI BIT results. A "BIT Failure Event Report" is sent to the DCI only if there was a failure detected.
Reset	The DCI commands the Detection Device (DD) to reset. The DD is given a full ammunition count, is made alive if dead, its event memory is not cleared, and BIT is not executed as a result of this command. A-reset event is reported to the DCI
Resurrect	The DCI commands the Detection Device (DD) to resurrect. The DD is made alive again if dead. The ammunition count is not changed, event memory is not cleared, and a bit is not executed as a result of this command. A resurrect event is reported to the DCI.
Miss	The DCI causes execution of standard miss actions in the Detection Device (DD). The DCI records a miss event and reports it to the DCI.
Hit	The DCI causes execution of standard hit actions in the Detection Device (DD). The DD records a hit event and reports it to the DCI.
Kill	The DCI causes execution of standard kill actions in the Detection Device (DD). The DD records a kill event and reports it to the DCI.

Name: Differential Data

Direction: DCI to SMODIM

Description: This data is reported to GPS in the DD to set the differential pseudo range corrections. the DD responds by sending an Acknowledge message to the DCI. Bytes 4 to N+6 shown below correspond directly to data bytes 3 through LEN-1, where LEN = 5*Nl+5*N2+6, of the "SET DIFFERENTIAL PSEUDORANGE CORRECTIONS' message (ID = OF hex) required by the MX7200 GPS Receiver. SMODIM provides the data to the GPS.

Use: This message is an immediate response to a "Differential Data Request' message from the DD.

Format:

Byte	Hex	Field	Description
1	BB	Sync	Identifies communication between DCI and SMODIM.
2	31	Message ID	Identifies Message type.
3	N+8 (hex)	Size	Total Message length in bytes.
4	xx	Data	4 MSB's = *Nl* number of type 1 RTCM corrections. 4 LSB's = *NI* number of type 2 RTCM corrections. (Total number of data bytes = *N* 5*Nl+5*N2).
5-6	xxxx	Data	Reference time for RTCM correction given as seconds in the hour, GPS time, LSB = 1.0 seconds. Low byte first.
7 to Nl*5+6	XX..XX	Data	Type 1 RTCM in accordance with RTCM 134-89/SC 104-68 corrections for up to 15 satellites. Each satellite correction packet requires 5 bytes and includes the correction, correction rate, issue of ephemeris identifier, scale, and UDRE bits.

Format (Differential Data continued):

7 Nl*5+7 to N+6	XX..XX	Data	Type 2 RTCM corrections for up to 15 satellites. Each satellite correction packet requires 5 bytes and includes the correction, correction rate, issue of ephemeris identifier, scale, and UDRE bits.
N+7 to N+8	XXXX	Checksum	Addition of bytes 1 through N+6. byte N+7 - Most significant byte. byte N+8 - Least significant byte.

Name: Ephemeris Data

Direction: DCI to SMODIM

Description: This message, or series of messages, contains detailed characteristics on the orbit of the satellites in view from the training area at a particular time. This data is reported to the GPS in the DD to set the satellite ephemeris data in order to perform "fast fixes". Bytes 4-76 shown below correspond directly to data bytes 3-75 of the 'SET SATELLITE EPHEMERIS" message (ID = OD hex) required by the MX7200 GPS Receiver. SMODIM provides the ephemeris data to the GPS.

Use: This message is in response to an "Ephemeris Data Request" message from the DD.

Format:

Byte	Hex	Field	Description
I	BB	Sync	Identifies communication between DCI and SMODIM.
2	30	Message ID	Identifies Message type.
3	4E	Size	Total Message length in bytes.
4	xx	Data	Satellite PRN.
5-28	xx..xx	Data	Packed subframe 1 data (given in ICD-GPS-200 format with parity bits, HOW and TLM words removed).
29-52	xx..xx	Data	Packed subframe 2 data (given in ICD-GPS-200 format with parity bits, HOW and TLM words removed).
53-76	xx..xx	Data	Packed subframe 3 data (given in ICD-GPS-200 format with parity bits, HOW and TLM words removed).
77-78	xxxx	Checksum	Addition of bytes 1 through 76. byte 77 - Most significant byte. byte 78 - Least significant byte.

Name: Set Initial Position, Time, and Date

Direction: DCI to SMODIM

Description: The purpose of this message is to re-initialize GPS with an approximate position, time, and date so that the initial satellite acquisition can be performed without resorting to search-the-sky. SMODIM uses the UTM data to set the local grid origin (southwest reference corner). The DD responds by sending an Acknowledge message to the DCI. Bytes 4-11, 22, 23, and 25-29 shown below correspond respectively to data bytes 3-17 of the "SET INITLAL POSITION, TIME AND DATE' message (ID 02 hex) required by the Na7200 GPS Receiver. Bytes 13-20 shown below correspond directly to data bytes 6-13 of the 'UTM COORDINATES FOR THE SOUTHWEST CORNER OF LOCAL GRID' message (ID = 17 hex) required by the MX7200 GPS Receiver. Byte 21 shown below corresponds directly to data byte 3 of the "SET LOCAL DATUM" message (ID = OA hex) required by the MX7200 GPS Receiver. In response to this message the DD reports a 'Reference Corner" event to the DCI. Map Grid WGS84 is used by the MX7200 GPS Receiver as a default value.

Use: This message is in response to an "Initial Position, Time, and Date Request' message from the DD. It is sent automatically at initialization.

Format:

Byte #	Hex	Field	Description
1	BB	Sync	Identifies communication between DCI and SMODIM.
2	32	Message ID	Identifies Message type.
3	1F	Size	Total Message length in bytes.
4-7	XX..XX	Latitude	Latitude of center of training area. 32 bit signed integer scaled LSB = 2^{-33} degrees. North positive. South negative. Range: -90 to

+90 degrees. Low byte first.

Format (Set Initial Position, Time, and Date - continued)

Byte	Hex	Field	Description
8-11	XX..XX	Longitude	Longitude of center of training area. 32 bit signed integer scaled LSB = 2 -2' degrees. East positive. West negative. Range: -180 to +180 degrees. Low byte first.
12	XX	UTM Zone	UTM Zone number. Range: 1-3C (hex), 1-60 (dec). 8 bits LSB = 1.
13-16	XX..XX	Easting	UTM Easting for SWRC. Range: 0-1,000,000 meters. 32 bit signed integer LSB = 1 meter. Low Byte first.
17-20	XX..XX	Northing	UTM Northing for SVTRC. Range: 0-20,000,000 meters. 32 bit signed integer LSB = 1 meter. Low Byte first.
21	XX	Datum	Local datum selection. Range: 01 through 34 (hex), 01 through 52 (dec). Examples: 1F NAD27, 31 = WGS84, and 1, 1 = EUR079.
22-23	XXXX	Altitude	Height above mean sea level. 16 bit signed integer scaled LSB = 1 meter. Low byte first.
24	XX	DOP Limits	GPS DOP limits.
25	XX	Year	Year since 1980. 8 bit unsigned integer.
26	XX	Month	8 bit unsigned integer. Range 1 to 12.
27	XX	Day	8 bit unsigned integer. Range 1 to 31.
28	XX	Hour	8 bit unsigned integer. Range 0 to 23.

29	XX	Minutes	8 bit unsigned integer. Range 0 to 59.
30-31	XXXX	Checksum	Addition of bytes 1 through 29. byte 30 - Most significant byte. byte 31 - Least significant byte.

Name: Set Local Time

Direction: DCI to SMODIM

Description: Local time is sent to the Detection Device (DD). The DD responds by sending an Acknowledge message to the DCI. Within the DD the real-time clock (RTC) is set and started accordingly. In response, the DD reports a "time Sync/Rollover' event to the DCI. The local time data consists of day of week, years since leap year, hours, minutes (place holder only), seconds (place holder only), date, month, and year.

Use: This message is used at initialization.

Format:

Byte #	Hex	Field	Description
1	BB	Sync	Identifies communication between DCI and SMODIM.
2	03	Message ID	Identifies Message type.
3	0C	Size	Total Message length in bytes.
4-10	XX ... XX	Data	Local Time in BCD. byte 4 - day of week/leap year. Least significant nibble = number of years since leap year, range: 0 to 3. Most significant nibble = day of week. 1 - Sunday 2 - Monday 3 - Tuesday 4 - Wednesday

5 - Thursday
6 - Friday
7 - Saturday
byte 5 - hour in BCD, range: 0 to 23 (dec).
byte 6 - minute in BCD, FF (hex) (not used)
byte 7 - second in BCD, FF (hex) (not used)
byte 8 - day in BCD, range: I to 31 (dec).
byte 9 - month in BCD, range: 1 (JAN) to 12 (DEC)
byte 10 - year in BCD, range: 0 to 99 (dec).

Format (Set Local Time continued):

Byte #	Hex	Field	Description
11-12	xxxx	Checksum	Addition of bytes 1 through 10. byte 11 - Most significant byte. byte 12 - Least significant byte.

Name: * Repeat Command

Direction: DCI to SMODIM

Description: The command is sent to the Detection Device if there is a discrepancy with the checksum or message length of the received message. After the DCI sends a repeat command to the Detection Device, the Detection Device repeats the last message it sent to the DCI.

Use: This message is used in normal operations.

Format:

Byte	Hex	Field	Description
1	BB	Sync	Identifies communication between DCI and SMODIM.
2	3B	Message ID	Identifies Message type.
3	05	Size	Total Message length in bytes.
4-5	OOFB	Checksum	Addition of bytes 1 through 3. byte 4 - Most significant byte. byte 5 - Least significant byte.

* Not implemented by the JMRC TPU, the Request Missed Events command is used.

Name: Request Missed Events

Direction: DCI to SMODIM

Description: A Request for Missed Events is sent to the Detection Device (DD) after the DCI has detected that it has not received some event reports. The DCI examines the event number field within the event reports to determine if it has missed event(s). The DD responds to a "Request Missed Events" message with a "Missed Events Report". The DCI can only request a maximum of 15 events at one time. DD report of missed events is limited to the last 500 events.

Use: This message is used in normal operations.

Format:

Byte	Hex	Field	Description
1	BB	Sync	Identifies communication between DCI and SMODIM.
2	2C	Message ID	Identifies Message type.
3	09	Size	Total Message length in bytes.
4-7	xx..xx	Data	First and last missed event numbers. Two unsigned integers. Range: 0 to 65535 for each. Last - First<15 byte 4 - Most significant byte of first event missed. byte 5 - Least significant byte of first event missed. byte 6 - Most significant byte of last event missed. byte 7 - Least significant byte of last event missed.
8-9	xxxx	Checksum	Addition of bytes 1 through 7. byte 8 - Most significant byte. byte 9 - Least significant byte.

Name: Set Vehicle Type

Direction: DCI to SMODIM

Description: The DCI sends this command to the DD to set its vehicle type. The DD responds with an acknowledge. This command performs a reset of the DD.

Use: This message is used in normal operations.

Format:

Byte	Hex	Field	Description
1	BB	Sync	Identifies communication between DCI and SMODIM.
2	02	Message ID	Identifies Message type.
3	06	Size	Total Message length in bytes.
4	xx	Aircraft Type	Hex values are from 00 to 04 (hex); see Table C-8.
5-6	xxxx	Checksum	Addition of bytes 1 through 4. byte 5 - Most significant byte. byte 6 - Least significant byte.

Name: SMODIM Unit Configuration Request

Direction: DCI to SMODIM

Description: The DCI requests the configuration of the Detection Device (DD). The DD reports back its configuration in a "Unit Configuration" message. The single data byte contains the interval in seconds that the SMODIM is to send GPS position and velocity updates to the DCI.

Use: This message is used at initialization and in normal operations. The DCI request unit configuration during normal operation after a "controller key detect" event has been reported by the DD. A "controller key detect" event may indicate that the controller has changed the DD type.

Format:

Byte#	Hex	Field	Description
1	BB	Sync	Identifies communication between DCI and SMODIM.
2	60	Message ID	Identifies Message type.
3	08	Size	Total Message length in bytes.
4	XX	GPS Data Update Interval	Number of 0.5 seconds between each position/ velocity report sent from the SMODIM LSB = 0.5 seconds. Maximum = 2 min 7.5 secs. 00=no GPS Data Updates are to be sent from the SMODIM.
5	XX	Radar Altitude Data Update Interval	Minimum number of 0.5 seconds between each Radar Altitude event report sent from the SMODIM .LSB= 0.5 seconds. Maximum = 2 minutes, 7.5 seconds. 00=No Radar Altitude Data updates are to be sent from the SMODIM. Default value of the SMODIM is 00.
6	XX	Heading Data Update Interval	Minimum number of 0.5 seconds between each Heading event report sent from the SMODIM. LSB = 0.5 seconds. Maximum =- 2 minutes, 7.5 seconds. 00=No Heading data updates are to be sent from the SMODIM. Default value of the SMODIM Is 00.
7-8	XXX	Checksum	Addition of bytes 1 through 4. byte 5-Most significant byte. byte 6-Least significant byte.

Name: UTC Time Start

Direction: DCI to SMODIM

Description: The DCI commands the SMODIM to begin sending UTC Date and Time messages once every second. The SMODIM responds by sending an Acknowledge message to the DCI.

Use: This message is used at initialization and in normal operations.

Format:

Byte#	Hex	Field	Description
1	BB	Sync	Identifies communication between DCI and SMODIM.
2	2A	Message ID	Identifies Message type.
3	05	Size	Total Message length in bytes.
4-5	00EA	Checksum	Addition of bytes 1 through 3. byte 4-Most significant byte. byte 5-Least significant byte.

Name: UTC Time Stop

Direction: DCI to VDD and
DCI to PDD

Description: DCI commands the Detection Device to stop sending UTC Date and Time messages. The DD responds by sending an Acknowledge message to the DCI. After the DCI has received valid time data in a UTC Date and Time message, the DCI sends a UTC Stop Time message to the Detection Device. (Note: There could be additional messages sent (up to 10) after sending this message.)

Use: This message is used at initialization and may be used during normal operation in both centralized and decentralized modes.

Format:

Byte #	Hex	Field	Description
1	BB	Sync	Identifies DCI/SAWE/MILES II communication.
2	2B	Message ID	Identifies message type.
3	05	Size	Total message length in bytes.
4-5	00EB	Checksum	Addition of bytes 1 through 3. byte 4 - Most significant byte. byte 5 - Least significant byte.

Name: Remote Event Message (36H)

Direction: DCI to SMODIM

Description:

Use:

Format:

Byte #	Hex	Data Element	Description
1	BBH	SAWE_SYNC	Identifies communication between SMODIM and DCI
2	36H	SAWE_DATA_MESSAGE_ID	Laser designator event
3	**17H**	SAWE_MESSAGE_SIZE	Total message length in bytes
4		LBA_EVENT_CODE	LBA event code
5-6		SAWE_NORTHING	designator position local grid northing
7-8		SAWE_EASTING	designator position local grid easting
9-12		LBA_TIME	time designation started
13-14		SAWE_NORTHING	aimpoint local grid northing
15-16		SAWE_EASTING	aimpoint local grid easting
17		LBA_DELTA_AZIMUTH	Delta Azimuth
18		LBA_DELTA_RANGE	Delta Range
19		LBA_TOF	Time of flight
20-21		LBA_LASER_CODE	Tri-service octal (missile laser code)
22-23		SAWE_CHECKSUM	Addition of bytes 1-**21**